THE DEVELOPMENT OF EXPERTISE IN READING AND READING INSTRUCTION: THE CONTINUUM FROM PRESERVICE TO ADVANCED EXPERIENCED TEACHERS AS MEASURED BY THE LITERACY INSTRUCTION KNOWLEDGE SCALES WRITTEN SURVEY

by

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ABSTRACT

The purpose of this study was to examine whether teachers with more teaching experience possess greater expertise with regards to content knowledge and pedagogical content knowledge than teachers with less experience, and to identify a collection of variables that contribute to the growth of content knowledge and pedagogical content knowledge. The sample for this study was comprised of 388 first, second, and third grade inservice teachers and 105 preservice teachers. Data were obtained through the use of two survey instruments. The first survey instrument, the *Teacher Demographic Information Survey* (TDIS), was an instrument used to collect background data on each participant. The second survey instrument, the *Literacy Instruction Knowledge Survey-Written Subscales* (LIKS-WS), was used to measure each participant's content knowledge and pedagogical content knowledge of reading and reading instruction. Analyses showed that the two constructs, content knowledge and pedagogical content knowledge are not well-defined, and therefore, a composite of the two was used in all analyses. Results from a one-way ANOVA indicated that literacy knowledge increases between preservice teachers and inservice teachers who have 1 to 21+ years of experience, but literacy knowledge remains stable across all these years. Results from the backwards deletion regression

identified four variables (gradevec1, gradevec2, yrseffectcode1, gradcoursevec1) which accounted for 68% of the variability in the composite measure of literacy knowledge.

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CHAPTER 1

INTRODUCTION

Description of the Problem

One of the most significant challenges facing our country is providing high-quality education for all students. A common belief is that high-quality education requires high-quality teachers. Due in large part to that belief, researchers have spent considerable time studying teacher quality, and this literature has consistently indicated two important facts (Clotfelter, Ladd, & Vigdor, 2006; Cochran-Smith & Zeichner, 2005; Darling-Hammond, 2000; Hanushek, Kain, O'Brien, & Rivkin, 2005; Goe, 2007; Zumwalt & Craig, 2008). First, teachers are the single greatest influence on student achievement (Aaronson, Barrow, & Sanders, 2003; Brophy & Good, 1986; Fraser, Walberg, Welch, & Hattie, 1987; Kemp & Hall, 1992; Mosenthal, Lipson, Torncello, Russ, & Mekkelsen, 2004; Rivkin, Hanushek, & Kain, 2005). Second, differences in teacher quality do indeed exist (Darling-Hammond, 2004; Goe, 2007; Rowan, Correnti, & Miller, 2002).

Due in part to findings regarding the influence of teachers on student achievement and to the growing professional consensus on what teachers should know, the past decade has seen a strong push by state and federal

governments, foundations, and national organizations for universities to produce high-quality teachers (American Federation of Teachers, 1999; Cochran-Smith & Zeichner, 2005; No Child Left Behind Act, 2001; NRP, 2000; Snow, Burns, & Griffin, 1998; Wong Fillmore, & Snow, 2002). Despite knowing that teacher quality does indeed affect student achievement, colleges, universities, states, and school districts are left with important questions regarding teacher quality. While there have been many studies that have looked at teacher quality variables, synthesis of the research indicates few variables that are strong and consistent predictors of teacher quality (Goe & Stickler, 2008). Of these variables, the current study examined the relationship between two teacher quality variables: teacher knowledge and teacher experience. What links these two variables is the developmental level of the teacher. According to developmental models of expertise, novices' experiences contribute to greater knowledge and greater knowledge can eventually develop into expertise. Whether expertise develops depends on other factors; however, a necessary but not sufficient prerequisite for expertise is greater knowledge. Therefore the specific problem that this dissertation explored was: Does teaching experience relate to greater teacher knowledge? If teacher knowledge is not developed through classroom experience, then other potential avenues to teacher expertise must be explored.

Theoretical insights on these two variables, knowledge and experience, can be seen in the general research of expertise. The theoretical framework of this study comes from the original theory of human expertise attributed to de

Groot (1978) and Simon and Chase (1973). Chi (2007) described this approach to studying expertise as the "*relative* approach" because it assumed that a more knowledgeable group of individuals could be considered "experts" and the less knowledgeable group "novices." In other words, the underlying assumption of the relative approach is that expertise is a level of proficiency that novices can achieve.

Using this framework, the current study was grounded on the premise that becoming an expert teacher is a developmental process; that is, teachers' knowledge grows and becomes more complex as teachers gain experience teaching (Snow, Griffin, & Burns, 2005). Teachers start out as novices, and through the accumulation of knowledge about their field, both in what they teach (i.e., content knowledge) and how they teach content (i.e., pedagogical content knowledge), they can become experts. In the body of the research literature on expertise, experts were defined as individuals with extensive professional experience (typically over 10 years), and who engaged in deliberate practice, that is, dedicated and focused practice to reach higher levels of performance in their chosen domain (Alexander, 1997, 2003a, 2003b; Chi, 2007; Ericsson, 1996; Ericsson, Charness, Feltovich, & Hoffman, 2007; Ericsson & Delaney, 1998; Ericsson & Smith, 1991). The expertise literature indicates that experts can be grossly assessed by measures such as academic qualifications (e.g., number of degrees), seniority or years performing the task, or consensus among peers. Experts "can also be assessed at a more fine-grained level, in terms of domain-specific knowledge or performance on tests" (Chi, 2007, p. 13). Thus, a more

skilled person becomes expert-like from having acquired *knowledge* about a domain, that is, from learning and studying (Chi & Bassok, 1989), and from the *experience* of intense practice over time, or "deliberate practice" (Ericsson, 2009; Ericsson, Krampe, & Tesch-Römer, 1993).

Based on earlier theories of human expertise (de Groot, 1978; Simon & Chase, 1973), Shulman's (1986b, 1987) concepts of content and pedagogical content knowledge, and Snow, Griffin, and Burns' (2005) model of professional growth in reading education, it would be straightforward to anticipate that teachers' knowledge would increase in both depth and breadth as they gain more experience as teachers and progress towards expertise. More specifically, one could hypothesize that (a) novice teachers would have the lowest levels of both content knowledge and pedagogical content knowledge about reading and reading instruction, (b) teachers at the induction stage would be expected to have intermediate levels of both types of knowledge, and (c) experienced teachers would have the highest level of both content and pedagogical content knowledge about reading and reading instruction.

Definitions of Constructs

Teacher Knowledge

Two kinds of teacher knowledge need to be distinguished in this dissertation. Teacher knowledge includes the *content knowledge* and

pedagogical content knowledge that teachers should know about the subject they teach.

Content Knowledge

The definition of content knowledge for this dissertation is based on Shulman's (1986a) definition of content knowledge as the "comprehension of the subject appropriate to a content specialist in the domain" (p. 26). For example, one aspect of a first grade teacher's content knowledge of literacy should include definitions of common content related concepts such as "phonemic awareness," which is the awareness that oral language consists of a sequence of sounds—specifically, phonemes—the individual sounds in words.

Pedagogical Content Knowledge

Pedagogical content knowledge is defined using Shulman's (1986b) description, which states that pedagogical content knowledge consists of "the most useful forms of [content] representation . . . the most powerful analogies, illustrations, examples, explanations, and demonstrations—in a word, the ways of representing and formulating the subject that makes it comprehensible for others" (p. 9). Therefore, when looking at the example of the first grade teacher, the teacher needs to have more than a basic understanding of phonemic awareness; the teacher also needs to know what phonemic awareness instruction looks like and what are some common problems faced by learners. In other words, being able to correctly define phonemic awareness is not enough.

The teacher also needs to know (a) how to teach segmentation so that students can identify sounds in the spoken word, for instance the three sounds in dish (/d/-/i/-/sh/); (b) activities to practice segmentation, such as "How many syllables are in a name?" (an activity where students try to clap out the syllables in their own names); and (c) common problems faced by English Language Learners, such as correctly saying the /sh/ sound.

Teacher Experience

The definition of teacher *experience* for this dissertation refers to the number of years of teachers' contractual teaching experience. Teacher participants in this dissertation research were assigned to one of six groups based on their amount of teaching experience. These six experience groups were defined as follows: (1) *preservice* teachers were defined as those teachers who have completed their student teaching, but who have not yet entered the teaching field; (2) *newly inducted* teachers were those teachers just completing their first or second year of teaching; (3) *early experienced* teachers were those teachers with 3 to 5 years of experience; (4) *intermediate experienced* teachers were those teachers with 6 to 10 years of experience; (5) *experienced* teachers were those teachers with 11 to 20 years of experience; and (6) *advanced experienced* were those teachers with more than 21 years of experience.

Purpose of the Study

The purpose of this study was to examine whether teachers with more teaching experience possess greater expertise with regards to these two types of knowledge than teachers with less experience. To gain more insight into this issue, this study addressed the following two questions regarding 1st - 3rd grade teachers: (a) How does content knowledge and pedagogical content knowledge about reading and reading instruction compare across preservice teachers to advanced experienced teachers?; (b) What combination of demographic variables, context variables, and educational background variables are the best predictors of literacy knowledge about reading and reading instruction?

Significance of the Study

At this time, there is little published research on teacher knowledge of reading and reading instruction, and how teachers make the journey from novice to expert throughout their professional career. Because current models of teacher knowledge of reading and reading instruction in the educational research indicate that teachers progress through a continuum based on their experience in the profession (Snow et al., 2005; Callahan, Griffo, & Pearson, 2009), information gained from this study will assist both teacher preparation programs and school districts in understanding knowledge of literacy at different stages in career development. Knowing how preservice teachers and teachers with a wide variety of experience vary in their reading and reading instruction knowledge, can inform the implementation of professional development programs with greater

effectiveness. Also, existing teacher mentoring programs, such as reading coach programs, can be augmented to aid teachers in continuing to expand their content and pedagogical content knowledge throughout their careers as they strive to become expert teachers. With information from studies like this one, administrators and policy makers will be provided concrete research-based evidence about teacher knowledge of reading and reading instruction with which to inform program and policy initiatives to improve teacher quality.

CHAPTER 2

LITERATURE REVIEW

Theoretical Framework: General Expertise Research

The theoretical model used in the current study is grounded in the general expertise research (Chase & Simon, 1973; Chi, 2007; Chi, Feltovich, & Glaser, 1981; Chi, Glaser, & Farr, 1988; de Groot, 1978; Ericsson, 1996, 2009; Ericsson, Charness, Feltovich, & Hoffman, 2007; Ericsson & Smith, 1991). The general expertise research includes the more traditional domains of expertise such as chess, music, sports and medicine (Ericsson, 2009), but has notably excluded education professionals (teachers). An explanation for why education professionals have been excluded from the general expertise research will be presented later in the teacher knowledge section. Two basic approaches researchers use to address the issue of expertise are: (a) the "absolute approach" (Chi, 2007), and (b) the "relative approach" (Chi, 2007). The absolute approach assumes that there are certain exceptional individuals who are qualitatively and quantitatively different from the vast majority of others, and it is only these exceptional individuals who are experts. The absolute approach will not be discussed here because it assumes that expertise is an innate quality, not capable of being learned.

In this study, I will use the “relative approach” to the study of expertise. This approach is significant to this study because the relative approach makes the assumption that all novices are capable of developing into experts. This assumption implies that the basic capacities and domain-general reasoning abilities of novices and experts are the same (Chi, 2007). In essence, this means that research has indicated that once a baseline intelligence level is met, all novices are “good enough” to match experts in general reasoning abilities and thus become experts themselves (Gladwell, 2008). Due to this assumption, the definition of expertise for this contrastive approach can be more relative in the sense that novices will be defined as a range of less knowledgeable individuals who are not members of the more knowledgeable group. Experts then are defined as the more knowledgeable group.

One benefit of using the relative approach is that there is more flexibility in how to define expertise because experts are defined as relative to novices on a continuum. In other words, expertise is the culmination of knowledge running along a continuum with the less knowledgeable groups, the “novices,” on one end, and the more knowledgeable group, the “experts,” on the other. Therefore, expertise can be viewed as a developmental model where individuals move from novice to expert over time. One benefit of using this developmental approach to expertise is that it allows us to understand how we can enable a less knowledgeable or skilled individual to become more knowledgeable or skilled because the assumption is that expertise can be obtained by all who are “good enough” (Chi, 2007). This goal of the relative approach to expertise has the

advantage of illuminating our understanding of knowledge acquisition, because presumably individuals become more expert-like from gaining knowledge about a domain. In fact, a core theory of the relative approach is that experts' knowledge develops as a consequence of many years of experience (10,000+ hours) in a domain (de Groot, 1978; Simon & Chase, 1973), along with deliberate practice with feedback (e.g., Ericsson, 2004, 2007; Ericsson, Krampe, & Tesch-Römer, 1993).

This definition of expertise characterizes experts as being more knowledgeable than novices. In a classic study on the amount of knowledge experts and novices possess, Chase and Simon (1973) used a recall method with chess experts. They found that chess experts could recall a greater number of pieces from a chess position than novices. This superior recall ability can be explained by the greater number of chess patterns (such as castle-king position) that experts can recognize, and each of the patterns contains more pieces than patterns that can be recalled by novices.

In addition, the relative approach assumes that differences in the performance of novices and experts are caused by the differences in the way their knowledge is structured and/or organized (Bedard & Chi, 1992; Chi, 2007). The structural and/or organizational differences between novices and experts can be seen in a study using a classic card sorting technique for assessing how experts and novices classify physics problems. Each card in the sort contains the text and diagram for a physics problem. Using these cards, the novice physics subjects tend to sort problems on the basis of literal, surface features,

such as the types of objects involved (e.g., a pulley). By contrast, the experts typically sorted the problems on the cards based on the principles used to solve the physics problems (e.g., conservation of mass). Researchers interpret this to mean that the structure and organization of experts' knowledge are more complex and interconnected and allow the information to be accessed more easily.

Developmental Models of Expertise in Educational Research

Similar to researchers who study expertise in other domains, educational researchers have shown interest in teacher developmental models that explain how teachers can progress from novice to expert in teaching. In essence, researchers in education have formed models and theories regarding teacher development using the relative approach to studying expertise. It should be noted that initially, teacher education researchers did not make reference to the general expertise research. However, this negligence changed as the field of teacher education research matured and researchers such as Berliner (1986, 1988, 1992, 1994) and Alexander (Alexander & Fives, 2000; Alexander & Judy, 1988) started using propositions culled from the general expertise research in the education literature.

Although much of the theoretical framework is grounded in the general expertise research concerning domains, such as chess, music, sports, and medicine (Ericsson, 2009), there are five developmental models in the educational research. I will make the case that these developmental models are

based primarily on the same assumptions as the relative approach found in the general expertise research. The first teacher development model is a continuum of teacher experience proposed by Feiman-Nemser (1983). The second model is Models of Domain Learning (MDL) proposed by Alexander (1997, 2000, 2003b). The third is a continuum of teachers' pedagogical knowledge proposed by Berliner (2004). The fourth, proposed by Shulman (1986b, 1987), is one that adds important vocabulary to the research literature. The final model of teacher knowledge is a continuum that is a fusion between the stages and phases proposed by Snow, Griffin, and Burns (2005).

Feiman-Nemser's Model

Feiman-Nemser (1983) developed a simple phase model of teacher knowledge development. In this model, Feiman-Nemser noted that despite educators' fondness for discussions regarding the concept of a preservice-inservice continuum of professional learning, there was in fact no comprehensive database on learning to teach. Therefore, Feiman-Nemser proposed a comprehensive approach to creating a database organized around a chronological learning-to-teach continuum. This continuum consists of four phases: (1) a pretraining phase, (2) a preservice phase, (3) an induction phase, and (4) the inservice phase. The pretraining phase, as Feiman-Nemser explains it, is any time before teachers start their formal pedagogical work. Hence, this phase is from the individual's infancy until they start their formal teacher education program. The preservice phase includes all of the education courses

and noneducation courses taken by teachers in college, as well as any supervised practice in classrooms. Next, the induction phase consists of the teachers' first year of teaching. Feiman-Nemser explains that the first year of teaching is unique in that it is unlike the phase before and likely to influence the phase that is to come. The fourth and final phase is the inservice phase. This phase begins during the second year of teaching and continues throughout the teachers' teaching career.

Despite the limited database to support her theory of development throughout a teacher's career, Feiman-Nemser makes several important observations. First, she observes that educators know very little about the preservice phase of teaching, or what prospective teachers actually learn during this time, a problem we still face today. Second, she observes that a large part of what teachers learn about teaching occurs "on-the-job" (Feiman-Nemser, 1983, p. 30) that is a common belief that is still considered to be true. Third, she observes that many educators have referred to the first year of teaching as "*the formative* phase in a teacher's career" (Feiman-Nemser, 1983, p. 30). Finally, she observes that teacher development studies suggest that "teachers only *begin* to concentrate on the relation between what they do as teachers and what students learn *after* they master the basic tasks of teaching, somewhere around their fifth year" (Feiman-Nemser, 1983, p. 30). Although the observations that the model is based upon imply that teacher knowledge changes with experience (developmental), this work did not make use of the existing general expertise research in other domains (e.g., chess, medicine, sports). Even though this

model appears simple and does not describe the types and progression of knowledge development that occurs as teachers gain experience, it is significant in that it implies that knowledge changes in different phases of a teachers' professional development.

Alexander's Model

Another model of teacher knowledge development was developed by Alexander (1997, 2003b). The Model of Domain Learning (MDL) is also a stage model, but unlike the Feiman-Nemser model, it contains subprocesses *within the stages*, rendering the model more complex (Alexander 1997, 2003b; Alexander & Fives, 2000). This model, originally developed to explain how students master the various academic disciplines that they must learn (e.g., mathematics, science, reading), is relevant for discussing the development of expertise in teachers because in many ways teachers are also students who need to master content knowledge.

According to the MDL, individuals who are on a trajectory to become experts go through three stages of professional development: (1) acclimation, (2) competency, and (3) proficiency (Alexander, 1997, 2003b; Alexander & Fives, 2000). According to Alexander, acclimation is the initial stage of an individual's knowledge growth, which may prove to be frustrating for the individual because the individual's knowledge is fragmented, the principles of the domain are not discerned, the big ideas might be overlooked, and judgments are not reliable regarding what is accurate information in the field. In the case of teachers at this

stage, one might note that they are not always pedagogically informed and might, for instance, assign material that is not developmentally appropriate to their students.

Likewise, as teachers make the transition to competency, according to Alexander, their knowledge becomes richer and more cohesive, they have a larger collection of instructional strategies that they can use in their teaching, and they realize that teaching and learning are closely intertwined. A combination of a higher level of content and pedagogical knowledge allows these teachers, as learners, to make better decisions about teaching content, as well as making quicker adjustments in the instructional environment as warranted.

Finally, according to Alexander's model, the content and pedagogical content knowledge becomes extensive and integrated with the teachers' way of thinking as expertise emerges at this stage. During this stage, teachers become "proficient"; that is, they are able to make data based decisions, teach other teachers, and add their own ideas to the knowledge base of the discipline. At this final stage, interest in learning and working in the domain can be sustained by the teacher over extended periods of time.

Berliner's Model

The work done by Berliner (1988, 1994, 2004) describing teacher development, is similar to Alexander's work in that it is also a developmental model with stages. However, Berliner's model is notable in its attempts to describe five stages of development of *expertise in pedagog*y, (1) novice, (2)

advanced beginner, (3) competent, (4) proficient, and (5) expert, as opposed to Alexander's three stage theory, that is instead more relevant to the development of content knowledge in learners.

Berliner's five stage model begins with the *novice* stage. At this stage, Berliner explains that "the commonplaces of an environment must be discriminated, the elements of the tasks to be performed need to be labeled and learned, and the novice must be given a set of context free rules" (Berliner, 2004, p. 205). According to Berliner, in education there are four "commonplaces": (1) Someone (e.g., a teacher), (2) is teaching something (e.g., reading), (3) to someone else (e.g., a student), (4) in some context (e.g., in a classroom). The factual knowledge associated with these four commonplaces is extensive and constitutes much of what novice teachers must learn at this stage. This factual knowledge includes the meanings of domain specific terms (e.g., fluency, higher ordered questions, and learning disabled), and context-free rules such as "have students raise their hands" or "don't personally criticize a student." At this stage, teacher behavior is usually rule-driven and inflexible. Only basic skill at the tasks of teaching should be anticipated from novices. Preservice teachers and many first year teachers are, according to Berliner, in this stage.

As preservice and first years teachers gain experience, Berliner proposes, they progress to the next stage, *advanced beginners*. At this stage, their experiences can become intertwined with verbal knowledge so that case knowledge is developed. For example, teachers who are novices and advanced beginners often have difficulty knowing what to do when a child challenges their

authority (Berliner, 2004). However, as experiences occur more than once and learning from these occurrences, teachers build case knowledge (practical knowledge). This practical, case-based knowledge develops during this second stage of development regardless of whether the experience was positive or negative. This practical knowledge is based on multiple cases with four features: (1) it is action-oriented knowledge; (2) it is generally acquired without direct help from others; (3) it is person and context bound; and (4) it is often implicit or tacit knowledge. In other words, it is difficult to transfer this knowledge to another person by means of writing it down or verbalizing this practical knowledge.

Besides practical knowledge, conditional and strategic knowledge are also accumulated at the advanced beginner stage. Conditional knowledge entails knowing *when* and *where* to access certain knowledge (i.e., facts or procedures) (Alexander & Judy, 1988, p. 376). Strategic knowledge entails understanding "*for what reasons* knowledge should be brought into play" (Alexander, 2006, p. 78). Eventually, attempts to use this accumulated conditional and strategic knowledge are guided by the advanced beginners' practical knowledge that allows them to determine when to break rules and when to follow the rules. However, these attempts are not always successful at this stage, because advanced beginners are still building their conditional and strategic knowledge. Many second and third year teachers are considered to be in this stage.

During the third stage, teachers typically with three or more years of experience, reach a level of performance that is considered to be *competent*. There are two basic characteristics of competent teachers: (1) they make

conscious choices (e.g., set priorities, decide on plans, have rational goals), and (2) while enacting their skills, they can determine what is and what is not important. Because they are more in control of the events around them, they have a sense of personal agency and therefore feel more responsible for their instruction. However, teachers at this stage are still "not yet very fast, fluid, or flexible in their behaviors" (Berliner, 2004, p. 207), as they will be in the final two stages.

This speed, fluidity, and flexibility is theoretically attained in the fourth stage of development, the *proficient level*, that will be reached by only a small number of teachers after approximately 5 years of experience. This is the stage where a teacher's "intuition or know-how becomes prominent" (Berliner, 2004, p. 207). Teachers at this stage appear to teach in a fluid effortless manner due to their ability to recognize patterns between events that novices are unable to detect. This ability to recognize patterns allows them to be more accurate in their predictions of and reactions to classroom events. Berliner (2004) compares teachers in the proficient stage to the expert individuals who play in chess tournaments or competitive bridge players.

In the *expert stage*, individuals usually do things that work based on their experience. Therefore, an expert's performance appears effortless and fluid in part because of their automaticity for dealing with routine situations. In most cases, experts "go with the flow" (Berliner, 2004, p. 208); however, when things are not turning out as expected, they initiate deliberately calculated processes to resolve the situation. Berliner acknowledges it may be difficult to discriminate

between the proficient and the expert stages in teachers. Although Berliner's model (1988, 1994, 2004) brings the richness of the expertise literature to the discussion of teachers' pedagogical content knowledge, his model does not discuss different types of knowledge, nor does he discuss the factors that affect learning at every stage of development.

Shulman's Model

A few years after Feiman-Nemser's (1983) work, Shulman (1986a) and his colleagues on teacher knowledge expanded the idea of professional knowledge for teaching. A central contribution of Shulman's work was to reframe the study of teacher knowledge from a focus on the general aspects of teaching to focusing on the role of content in teaching (Ball, Thames, & Phelps, 2008). This can be seen in his development of typologies. For instance, Shulman and his colleagues expanded the idea of teacher content knowledge to include three subcategories: (1) subject matter knowledge, (2) curricular knowledge, and (3) pedagogical knowledge. Although the specific definitions and names of categories varied across publications, the importance of these categories was that they highlighted the important role of content knowledge, and situated the content-based knowledge in the larger picture of professional knowledge for teaching.

An example of this development of typologies and its associated changes in terminology-related definitions can be seen in his initial publication of his model, in which he used the term "subject matter knowledge" (Shulman, 1986a).

What Shulman was referring to when using the term subject matter knowledge was the amount and organization of knowledge around a specific domain (e.g., science, history) in the mind of the teacher. Shulman (1986b) later elaborated that subject matter content knowledge goes beyond the facts and concepts of a domain, to include the variety of ways in that the basic concepts and principles of the discipline are organized to incorporate the facts, as well as ways in that concepts of the domain are validated or invalidated. For example, a history teacher's subject matter content knowledge not only includes basic facts about the American Revolutionary War, but also how the war relates to other aspects of history, such as the French and Indian War, the characteristics of the colonies, and the colonies' relationship with England before and after the beginning of the Revolutionary War (Eggen & Kauchak, 2004). From this point on, Shulman interchanged the terms subject matter content knowledge and subject matter knowledge with the term content knowledge (as defined in chapter 1).

The second term used by Shulman in his initial discussion of his model was "pedagogical content knowledge." Pedagogical content knowledge was described by Shulman as "the particular form of content knowledge that embodies the aspects of content most germane to its teachability" (Shulman, 1986b, p. 9). In other words, pedagogical content knowledge goes beyond simple content knowledge, and encompasses an understanding of how to make a specific subject comprehensible to others. Shulman described pedagogical content knowledge as "the most useful forms of [content] representation… the most powerful analogies, illustrations, examples, explanations, and

demonstrations—in a word, the ways of representing and formulating the subject that makes it comprehensible for others" (1986b, p. 9).

Although introducing new constructs that describe teachers' knowledge, namely content knowledge and pedagogical content knowledge, are a significant contribution and aid in the discussion of developmental models of teacher knowledge, Shulman went one step further. In addition to outlining the domain of teacher knowledge and the categories of teacher knowledge (content knowledge and pedagogical content knowledge), Shulman also introduced the idea of three forms of teacher knowledge: (1) propositional knowledge, (2) case knowledge, and (3) strategic knowledge. He explains that most of what teachers are taught is in the form of propositions. Propositions in this case are relatively simple surface level knowledge, such as lists of behaviors for teachers to practice, or the wisdom of teaching experience passed on to new teachers. For example, one point of wisdom is that teachers should use an appropriate wait time after asking students a question. However, case knowledge, a deeper level of knowledge, is described as being knowledge of specific, carefully documented, and well described events. The third and final form of knowledge, strategic knowledge, is described by Shulman as the knowledge that is developed when understanding single principles or the understanding gained when situational cases are incompatible with each other. For Shulman, strategic knowledge is the most complex form of knowledge. These associated forms of knowledge are key pieces of the developmental aspect of Shulman's concept of teacher knowledge development, because they explain how Shulman envisioned teacher knowledge

developing from simple surface level knowledge of facts, to more complex knowledge that could be used strategically by teacher who possessed more expertise.

Thus, an understanding of content knowledge, pedagogical content knowledge, and the associated forms of knowledge (propositional, case, and strategic), lay the groundwork for understanding Shulman's (1986, 1987) model regarding the development of "teacher knowledge growth" (p. 4), that were based on comparing veteran teachers with novice teachers. Shulman indicated that the knowledge, understanding, and skill often seen in expert teachers are not displayed with the same ease and fluidity by novices (an important point that is echoed in the general expertise research).

Snow, Griffin, and Burns' Model

The final developmental model in the education research literature to be discussed was first proposed by members of the National Academy of Education's Reading Sub-committee (Snow, Griffin, & Burns, 2005), and was published in a book titled *Knowledge to Support the Teaching of Reading: Preparing Teachers for a Changing World* (Snow, Griffin, & Burns, 2005). This model attempts to explain the role of teacher knowledge in a developmental model that contains an underlying continuum that is a fusion between stages and phases. This model contains levels of "*progressive differentiation*" that roughly correlate with five different points in a teacher's career: (1) preservice, (2) apprentice, (3) novice, (4) experienced, and (5) master.

In addition to these five points in a teacher's career, there are, according to Snow et al., five types of knowledge that teachers develop and that are roughly associated with each point. These five types of different, sequential, and increasing sophisticated types of knowledge are: (1) declarative knowledge, (2) situated, can-do knowledge, (3) stable procedural knowledge, (4) expert, adaptive knowledge, and (5) reflective, organized, and analyzed knowledge.

Using these types of knowledge, it is possible to describe the five levels of progressive differentiation (the five points in a teacher's career) in this developmental model by "characterizing the type of knowing that dominates at each point" (p. 7). For example, preservice teachers are primarily engaged in acquiring the first type of knowledge: *declarative knowledge*. Declarative knowledge is knowledge from lectures or books about instructional methods, child development, or classroom management, which allows the preservice teacher to answer questions about what one should do in various situations.

After declarative knowledge, the second type of knowledge is the *situated, can-do procedural knowledge*. Because procedural knowledge or "how-to-do–something" knowledge is complex, this is the first type of procedural knowledge where the teacher can effectively function in a simple situation. For example, apprentice teachers can teach a small group instructional lesson for learners who are all at the same level of instruction. This is also the type of knowledge commonly found in some preservice teachers as they first begin to work with students. Teachers who possess this type of knowledge would know that a phoneme is a basic unit of sound, that phonemic awareness is a subcategory of

phonological awareness, and that it is important for young children to possess phonological awareness.

Next in this model, a well-prepared first year or novice teacher should have *stable procedural knowledge*, that is, they should have enough declarative and procedural knowledge to make their understanding stable enough so that they can function and know how to do things under "normal circumstances." Teachers who possess this type of knowledge would possess an understanding of several different aspects of phonemic awareness (e.g., blending and segmentation), as well as a few different ways to engage students in its application (e.g., rhyming games and alliteration tasks), although, at this stage, teachers might be inflexible in their use of this knowledge.

The fourth level of knowledge in this model is *expert, adaptive knowledge*. Experienced teachers have expert adaptive knowledge and can cope with a wide array of instructional challenges. They can identify problems that the current research base offers inadequate guidance, can research new studies with new insights, and can incorporate the new knowledge into their knowledge structures. Teachers who possess this type of knowledge are aware of the strengths and weaknesses of various phonemic awareness programs, and are aware of how to match different students with programs that would most benefit them. In addition, teachers with this type of knowledge are able to teach in staff development sessions less knowledgeable teachers how to use different programs of phonemic awareness and how to administer phonemic awareness tests to students.

According to this model, the final type of knowledge is the *reflective, organized, analyzed knowledge* that is typically held by expert teachers. Expert teachers have enough knowledge at this level to reflect and analyze what they have learned in inservice workshops, in courses, read in books, or heard in professional conferences or seminars. For example, expert teachers can critically examine phonemic awareness programs and assessments, and consequently make accurate predictions regarding programs that are more likely to be successful with different groups of students. These teachers would be an asset in district-wide committees to develop professional development programs for improving phonemic awareness instruction.

The Snow, Burns, and Griffin (2005) model implies that as teachers learn more and gain more experience, their knowledge base changes in two different ways (Pearson, 2007): First, their quantity of knowledge increases. In other words, as teachers gain more experience, they know more. Second, the ratio or proportion of the knowledge base that is allocated to the five types of knowledge changes, so that the knowledge base changes and reflects more advanced knowledge as the teacher moves from the novice to the expert end of the continuum. Therefore, within these levels of progressive differentiation, teachers have different levels of knowledge (declarative knowledge; situated, can-do knowledge; stable procedural knowledge; expert, adaptive knowledge; and reflective, organized, analyzed knowledge). In this way, the model attempts to acknowledge “that learning to teach is a process in which expertise develops

over time and is marked by increasing sophistication of and control over complex and multifaceted knowledge base" (Snow et al., 2005, p. 206).

Conclusion of Developmental Models of Expertise in Educational Research

All of the described developmental models acknowledge that "learning to teach is a process in which expertise develops over time and is marked by increasing sophistication of and control over a complex and multifaceted knowledge base" (Snow et al., 2005, p. 206). The developmental models used in the current study are the Shulman model (1986a, 1986b, 1987) and the Snow, Griffin, and Burns (2005) model. To reiterate, these two models make the same three theoretical assumptions as the relative approach to expertise. First, all novices are "good enough" to become experts. Second, experts are individuals who have obtained more knowledge than novices in their domains (i.e., mathematics, science, reading, etc.). Third, differences in the performances of novices and experts are caused by the differences in the way their knowledge is structured and/or organized.

The Shulman model is important to this dissertation for two reasons: (a) it acknowledges that teacher knowledge is developmental, and (b) it contributes essential vocabulary (content knowledge and pedagogical content knowledge) needed for a discussion of the different kinds of knowledge that develop as novices develop into experts. Although the Shulman model acknowledges the developmental nature of teacher knowledge, the Snow et al. model does more

than just acknowledge the developmental nature of teacher knowledge; it uses levels of teacher experience (a) preservice, (b) apprentice, (c) novice, (d) experienced, and (e) master, to explain how teacher knowledge develops in both depth and breadth with experience. Used together, these two models will frame this study regarding (a) teacher knowledge (content and pedagogical content knowledge), and (b) teacher experience.

Teacher Knowledge

Developmental models of teacher expertise have suggested that teacher knowledge changes, often in depth and breadth, with teaching experience, yet historically this belief was not apparent in articles that discuss the knowledge that teachers were expected to possess. For example, once it was believed that teachers merely needed a basic type of knowledge, often no more than high school knowledge, to be able to teach successfully. The history of this belief in a simple form of teacher knowledge can be found summarized in articles such as *Reading Teacher Education in the Next Millennium: What Your Grandmother's Teacher Didn't Know That Your Granddaughter's Teacher Should* (Hoffman & Pearson, 2000). However, beliefs about teacher knowledge have indeed changed from the time our grandmother's teachers became educators (Feiman-Nemser, 2008; Hiebert, Gallimore, & Stigler, 2002; Pearson, 2007).

Although beliefs about teacher knowledge have changed over time, the field of teacher knowledge is still quite young. Despite this, as research on teacher knowledge has progressed, changes in developmental models of teacher

knowledge have become apparent. Research has moved from simple models to more complex models. For example, Doyle (1977) was one of the first to suggest that there might be more to teacher knowledge than just knowledge of content matter. This lead to researchers such as Shulman (1986a, 1986b, 1987) and others to theorize that there is not just one type of teacher knowledge, but that there are multiple types of knowledge, and thus multiple terms needed to describe the construct that is commonly referred to as teacher knowledge—the knowledge that teachers need to know to teach students. Shulman (1986a) went on to assert that teacher knowledge was the "missing paradigm" because the research on teaching had not yet provided the field with a workable knowledge base with which to define teacher knowledge. It is due in large part to this "missing paradigm," this lack of a definition of what constitutes knowledge for teachers pointed out by Shulman, which has kept general expertise researchers from exploring expertise in teachers.

As mentioned earlier during the discussion of Shulman's model, this study is going to use two of Schulman's constructs to describe teacher knowledge: (a) content knowledge, and (b) pedagogical content knowledge. First, I will discuss briefly, the need for defining content knowledge for a content area and how researchers have initially explored the issue of teacher knowledge of reading using a broad definition of teacher knowledge of reading and an equally broad assessment of this knowledge. Then, I will discuss a more structured, narrower definition of teacher knowledge and how researchers, using a more narrow definition of teacher content knowledge of reading, have

assessed teacher content knowledge of primary grade reading and reading instruction using more fine grained assessments. Finally, following the discussion of content knowledge, I will address the construct of pedagogical content knowledge.

Content Knowledge

Content knowledge, a construct used throughout educational research, encompasses what Bruner (1967) called the "structure of knowledge," that is, the theories, principles, and concepts of a particular discipline. In all educational disciplines, researchers have faced the problem of identifying the content knowledge that matters for teaching (Alexander, 1992a; Alexander, Schaller, & Hare, 1991; Ball, 1990, 1991, 2000; Ball & Bass, 2000; Ball, Lubienski, & Mewborn, 2001; Darling-Hammond & Bransford, 2005; Grossman, Wilson, & Shulman, 1989; Gess-Newsome & Lederman, 1995; Hill, Rowan, & Ball, 2005; Hill, Schilling, & Ball, 2004; Leinhardt & Smith, 1985; Monk, 1994; Monk & King, 1994). In some disciplines, content knowledge is easier to define. Mathematics, for example, has a factual linear progression of content knowledge; thus it is easier to define. For instance, it is easy to understand that content knowledge in mathematics includes learning to count and to add, and both of these types of knowledge must be known and understood before an individual can master algebra. Being able to clearly define content knowledge, as researchers are able to do in mathematics, is a key to being able use general expertise theories or developmental models to explain how teachers progress from novice to expert.

However, identifying content knowledge in literacy, like they have done in mathematics, has proven not to be as simple; in fact, the identification of content knowledge of literacy is often rather ambiguous (McCutchen, Harry, Cunningham, Cox, Sidman, & Covill, 2002).

Content knowledge in literacy: A need to define domain knowledge. Researchers have yet to adequately define the construct of teacher content knowledge of literacy so that it is clear to all exactly what knowledge teachers need to possess to teach young children how to read and write. The difficulty researchers have had in identifying and delineating the knowledge base for content knowledge of literacy explains, in part, their use of gross-grained assessments of teacher knowledge of literacy; namely proxies.

Gross assessments of domain knowledge of literacy: Proxies. Initially, gross-grained assessments of teachers' content knowledge of reading were done using proxies for teachers' knowledge of reading (Phelps, 2009). These proxies include coursework, grades, subject matter education, degrees, test scores, credentials, and state teacher certification status. A limitation of using proxies is that proxies are broad, indirect, measures that have a large degree of variability (Croninger, Rice, Rathbun, & Nishio, 2007; Goe, 2007). Therefore, it is not unexpected that the use of proxy measures has been found to show ambiguous effects on student achievement (Ball et al., 2001). Despite these limitations, proxies of teacher knowledge of reading were used and continue to be used to as in indicator of the amount of knowledge teachers possess and to determine if

teacher knowledge affected student achievement as measured by standardized tests (Grossman et al., 1989).

An important point to note is that there are many studies that have assessed teacher content knowledge as measured by proxies. However, it is not my goal to present an exhaustive review of all of these studies. A complete list and more in-depth review of individual studies can be seen in the research synthesis done by Goe (2007) and Rice (2003). Instead, I would like to present several relatively recent studies that demonstrate how researchers have used proxies as gross-grained assessments of teacher content knowledge. Studies, such as the ones I am about to present, have laid the foundation for the discussion of the relevance of teacher knowledge and how little we really know about it. If indeed teacher knowledge matters as the research suggests, then these studies, like the studies that came before them, also employ gross assessments of teacher knowledge (proxies). These studies are the perfect catalyst for a discussion on our need for a deeper understanding of what teacher content knowledge of literacy/reading is, and how we can best achieve this goal. Next, I will discuss six large-scale studies that have been published in the past decade that have used proxies to examine teacher knowledge.

Darling-Hammond, Holtzman, Gatlin, and Heilig (2005) examined the impact that teachers have on student achievement in reading. This study used data on grades 3-5 from the Houston Independent School District (HISD) for the years 1995—2001. The purpose of this study was to examine how teacher preparation and certification influence teacher effectiveness for both Teach for

American and for other teachers. Darling-Hammond, et al. used three different measures of student achievement in their reading: (1) the Texas Assessment of Academic Skills (TAAS), (2) the Stanford Achievement Test, 9th Edition (SAT-9), and (3) the Aprenda. Overall, teachers with standard certification were found to be significantly more effective in raising student test scores than teachers without certification, or with substandard certification. The implication here is that teachers who are certified have more knowledge than those who do not, that accounts for differences in their students' performances on standardized tests. Support for this implication made about the Darling-Hammond et al. findings can be found in the research in other areas of teaching, such as mathematics (Ball, 1990; Carpenter, Fennema, Peterson, & Carey, 1988; Leinhardt & Smith, 1985).

Using grade levels similar to Darling-Hammond et al. (2005), Carr (2006) examined the effects of teacher knowledge on 3rd - 8th grade students' achievement in reading by using National Assessment of Educational Progress (NAEP) data from the 2004-2005 school year, from the Ohio Department of Education (DOE). The purpose of this study was to analyze the factors most commonly thought to affect student achievement. Due to the focus of the current study, the only factor that will be discussed from the larger study done by Carr is that of teacher knowledge. In this study, teacher knowledge was measured by the proxies of the rating as "highly qualified" under No Child Left Behind (NCLB) and masters' degrees. Carr's findings indicate that students who had teachers who were rated "highly qualified" under NCLB had higher achievement scores than students who had teachers with master's degrees. Therefore, if one uses

the same implications about teacher knowledge as was made about Darling-Hammond et al.'s (2005) study, namely, that more teacher knowledge equals higher student achievement, one would conclude that, teachers who are considered "highly qualified" under NCLB have more knowledge than teachers with master's degrees. Although Darling-Hammond et al. (2005) and Carr's (2006) findings suggest a pattern in the research indicating the significance of teachers who have more knowledge as indicated by proxies, not all studies using proxies for teacher knowledge report similar findings.

For example, Betts, Zau, and Rice (2003) used data from the San Diego Unified School District (SDUSD) database that were collected for elementary, middle, and high school students between the fall 1997 and spring 2000. The purpose of the study was to examine the trends in student achievement as measured by the Stanford 9 achievement test with a focus on the achievement gap among schools and demographic groups, to determine which factors have the most influence on the rate at which student achievement increases. Although the study looked at many factors, the only factor that will be discussed here is teacher knowledge. Teachers' level of education and credentials were used as proxies for teacher knowledge when looking at student achievement. The authors found that the correlations between teacher knowledge and student achievement varied substantially across grades. According to Betts et al.'s findings, elementary student gains in reading were higher when students were taught by an emergency certified teacher rather than a fully certified teacher. However, the authors also reported that in middle school, student reading

achievement gains were correlated with English teachers who had a PhD in any subject. Therefore the findings regarding the amount of knowledge teachers possessed, as measured by the status of their certification and highest degree achieved varied by grade level, and were ambiguous at best.

To compound the ambiguity of regarding teacher knowledge, Kane, Rockoff, and Staiger (2006) looked at data from New York City public schools for the years 1998-2005. The student sample for this study included NAEP data for grades 3 - 8. The purpose of the study was to evaluate the effectiveness of certified, uncertified, and alternatively certified teachers. Similar to Holtzman et al. (2005) and Betts et al. (2003), teacher knowledge in this study was measured by the proxy of teacher certification. The findings of Kane et al. indicated that there was little or no difference between student achievement scores of certified, uncertified, or alternatively certified (AC) teachers. The Kane et al. study was neither the first nor the last study that looked at teacher certification data and student achievement and reported nonsignificant or uninformative findings.

For example, in the year proceeding the Kane et al. study, Goldhaber and Anthony (2004) used data from North Carolina for the years 1996-1999 to examine the relationship between the certification of teachers by the National Board for Professional Teaching Standards (NBPTS) (National Board Certification) and elementary-level student achievement as measured by North Carolina's Department of Public Instruction (NCDPI) test. Specifically, the authors wanted to (a) determine whether NBPTS assesses the most effective applicants, (b) whether certification by NBPTS serves as a signal of teacher

quality, and (c) whether completing the NBPTS assessment process serves as a catalyst for increasing teacher effectiveness. The authors found statistically significant but not practically important student achievement gains for students whose teachers had completed the NBPTS. Also, the authors noted that student achievement gains for North Carolina teachers who would become NBPTS certified in the future (as determined by the longitudinal data examined) were just as effective as those who had already attained NBPTS certification. So once again, there were ambiguous findings regarding the amount of knowledge teachers possess as measured by the proxy of certification, in this case the NBPTS certification.

Like Goldhaber and Anthony (2004), Clotfelter, Ladd, and Vigdor's (2007) more recent study also used data from North Carolina. Longitudinal data from all third-, fourth-, and fifth-grade students in years 1995 - 2004 were used to determine the contributions of teacher licensure test scores, advanced degrees, NBPTS, and undergraduate institution attended on student achievement, as measured by NCDPI tests. The authors report that NBPTS status did not have a significant effect on reading scores, which is consistent with findings from Goldhaber and Anthony's study (2004). In addition, the researchers found a negative effect on student achievement for teachers with advanced degrees. The question remains why there is such a counter intuitive finding, that teachers' with higher degree levels appear to have a negative effect on student achievement.

Conclusion of proxies. When looking across studies that have used proxies for teacher knowledge, there is the issue of a lack of consistency among the findings of the studies that have been performed. Research syntheses, like the ones previously mentioned as references (Goe, 2007; Rice, 2003), also note a lack of consistency when looking across studies; yet note that it appears that teacher knowledge matters. As Monk (1994) pointed out, the ambiguity in teacher knowledge studies regarding reading may indicate the need for future studies employing more fine grained assessments of teacher knowledge of reading than those that have been done using proxies. This call for fine grained assessments simply highlights the limitations of gross grained assessments, such as proxies, and is an acknowledgement from the research community regarding the need for a deeper more detailed understanding teacher content knowledge of literacy (Papay, 2011; Phelps & Schilling, 2004; Rice, 2003). To gain further understanding of teacher content knowledge, it is critical to more clearly define what constitutes content knowledge of literacy, or in the case of the current study, what defines content knowledge of reading and reading instruction.

Refining the definition of content knowledge of reading and reading instruction. One approach to discussing content knowledge of reading and reading instruction (i.e., the approach that will be used in this study), is to evaluate the research base on what constitutes effective reading instruction. Over the past few decades, the efforts of researchers to understand reading development, reading problems, and reading instruction has added a significant amount of information to the knowledge base regarding effective research-based

methods of teaching literacy. The formation of this substantive and ever growing knowledge base can be seen in the existing four Handbooks of Reading Research (Barr, Kamil, Mosenthal, & Pearson, 1991; Kamil, Mosenthal, Pearson, & Barr, 2000; Kamil, Pearson, Moje, & Afflerbach, 2011; Pearson, Barr, Kamil, & Mosenthal, 1984) and in policy statements made by national literacy panels and national reading organizations (International Reading Association, 2000; National Commission on Teaching and America's Future, 1996; NELP, 2008; NRP, 2000).

These scholarly efforts and the resulting patterns emerging from the research literature have affected educational policy in the U.S. at many different levels. For example, perhaps the most well-known and influential finding that has emerged from the research are the five essential components of instruction explicitly enumerated in the National Reading Panel (2000). These five essential components are: (1) phonemic awareness, (2) phonics, (3) fluency, (4) vocabulary, and (5) text comprehension (NRP, 2000). The NRP's five essential components have provided the content framework for many advisories, guidelines, and policies adopted by states, and are required in programs funded by the federal Reading First program of the No Child Left Behind Act of 2001, PL 107-110, 115 Stat. 1425, 20 U.S.C. § 6301 (2008). Therefore, these five components compiled by the NRP have led to a professional consensus that has been reached by literacy/reading experts. The acceptance of this professional consensus by states and federal programs has brought us closer than we ever have been before to defining the construct of content knowledge of reading. Although, it should be noted that this consensus does not define the actual

knowledge that teachers should have in order to effectively teach. The consensus indicates only what works for students in terms of providing effective literacy instruction. The logical conclusion, however, is that teachers must have the content knowledge of these five components of effective literacy instruction if they are to be successful at providing reading instruction. The LIKS-WS instrument that is used in this study makes use of this consensus of reading professionals to frame teacher content knowledge (and pedagogical content knowledge) on the five NRP components.

Now that I have described how a professional consensus has been reached on what type of reading instruction is most beneficial to students, how this consensus can be used as a foundation for content knowledge of reading, and that the LIKS-WS instrument uses this professional consensus, I will describe existing research studies on teacher content knowledge of reading. I will use these studies to help explain how researchers have used surveys to expand our understanding of teacher content knowledge of reading and reading instruction.

Research on teacher content knowledge of reading. Based in part on the realization that gross grained assessment of teacher knowledge, namely proxies, were reporting ambiguous findings and the growing evidence of the importance of teacher knowledge on student achievement in other academic domains (Brophy & Good, 1986; Lyon & Weiser, 2009; McCaffrey, Koretz, Lockwood, & Hamilton, 2004; Rowan, Correnti, & Miller, 2002; Sanders, 1998), researchers began exploring the use of surveys as more fine grain assessments of teacher

knowledge (Phelps, 2009; Phelps, et al., 2004; Reutzel, Dole, Sudweeks, Fawson, Read, Smith, Donaldson, Jones, & Herman, 2007). However, once researchers decided to use of surveys, they faced an issue previously discussed in this chapter: a need to define what constitutes content knowledge of reading and reading instruction.

This historic lack of professional consensus on the substance of content knowledge for reading and reading instruction has resulted in the researcher community investing considerable time and effort in constructing a variety of surveys that evaluate certain isolated aspects of teacher knowledge of literacy (Brady, Gillis, Smith, Lavalette, Liss-Bronstein, Lowe, North, Russo, & Wilder, 2009; Cheesman, McGuire, Shankweiler, & Coyne, 2009; Cunningham & Stanovich, 1990; Lane, Hudson, Leite, Kosanovich, Strout, & Wright, 2009; Moats, 1994), with varying degrees of success. Time spent on these endeavors is not a bad thing; however, the result of such effort does not fully capture or assess the breadth of knowledge that NRP (2000) indicates teachers of reading should possess.

In the next section, I will not attempt to do an exhaustive review of all the studies and their associated survey instruments constructed to assess teacher content knowledge of literacy/reading. Instead, I have culled selected studies and their associated surveys to paint a picture of how teacher knowledge has been measured in the past and to suggest how using the LIKS-WS in this study will make the picture clearer. Although it would be logical to organize a review of these studies according to the five essential components of NRP (2000),

phonemic awareness, phonics, fluency, vocabulary, and comprehension, there are not enough studies in each of these individual areas to organize the review in this manner. The selected studies, however, have examined various aspects of content knowledge of teachers who currently teach or plan to teach in the following types of classrooms: regular and special education, regular education, and special education. Therefore, the review is organized around these three groupings of teacher participants.

Regular and special education. The first of six surveys that I would like to discuss in this section was given to both regular and special education teachers to assess their knowledge of the structure of English and text. This survey, the Informal Survey of Linguistic Knowledge, was developed by Louisa Moats (1994), a linguistic scholar, to evaluate what she considered important aspects of teacher knowledge, knowledge of spoken and written language structure. Moats administered her survey to a group of reading teachers, special education teachers, classroom teaching assistants, speech-language pathologists, and graduate students (N = 52) who were enrolled in a course called "Reading, Spelling, and Phonology." The average teaching experience of the group was 5 years, with a range of 0 to 20 years, and the student population range that the group taught was from kindergarten through adulthood.

The results of the survey indicated that teachers did not have a sufficient grasp of spoken and written language structures to be able to effectively teach beginning readers or those with reading/spelling difficulties. For example, Moats (1994) reported that only 10 to 20% of all participants were able to consistently

identify consonant blends in written words. She summed up her concerns with the following statement: “The results were surprisingly poor, indicating that even motivated and experienced teachers typically understand too little about spoken and written language structure to be able to provide sufficient instruction in these areas” (p. 81). Moats’ findings were significant in that they addressed one aspect of content knowledge for teaching reading as it is defined in this dissertation. Content knowledge is necessary to provide explicit instruction in reading because if teachers hold misconceptions and misunderstandings such as those indicated in the survey, their ability to provide effective instruction will be hampered. In addition, it is worth noting that Moats’ survey does not asses all of the essential components of NRP (2000) nor teachers understanding of whole language (a popular theory in reading between 1980 - 1995), that would have given a broader view of the content knowledge possessed by the teachers who took this survey.

A few years after Moats’ study, McCutchen and Berninger (1999) conducted a study that looked at some of the same aspects of teacher knowledge. In their study, McCutchen and BeringerBerninger worked with participants who were K-4 grade regular and special education teachers (*n* = 59) during a 2 week summer institute (the experimental group) and an equal number of regular and special education teachers (the control group; *n* = 59) who were on their wait list to take the summer institute following the research study. The authors’ pre- and posttest of the teachers used an alternative form of the Informal Survey of Linguistic Knowledge survey developed by Moats (Moats, 1994; Moats & Lyon, 1996). The authors observed the experimental and control groups in

their classrooms across the school year, assessing the teachers' classroom practices and their students' learning. Results of pre- and post- survey findings and classroom observations indicated that some teachers were more successful at incorporating new knowledge into classroom practice than others, thus indicating some teachers require more scaffolding when acquiring new knowledge than their peers. The fact that researchers have found that teacher knowledge can change with experience is significant in that it lends empirical evidence to our understanding of teacher knowledge development in reading. However, a limitation of this study is that it looked only at the narrow view of teacher knowledge as assessed by the alternative form of the Informal Survey of Linguistic Knowledge, not a broad view of teacher knowledge as defined by NRP (2000). This is an important point that will be made about many of the following surveys/studies.

The third study, done by McCutchen, Harry, Cox, Sidman, and Covill (2002) explored a broader view of teacher knowledge than McCutchen and Berninger (1999) by using more than one survey instrument in their study. In this study, 59 teachers were recruited by letters of invitation: 24 taught K, 27 taught first grade, second grade, or a combination of the two grades, and 8 taught special education classes. To measure teachers' knowledge of children's literature, the researchers used the Title Recognition Test (TRT) (Cunningham & Stanovich, 1991), which will be discussed in some detail later in this chapter. To measure teachers' knowledge of phonology, the researchers used the Informal Survey of Linguistic Knowledge (Moats, 1994). The authors also tested teachers'

general knowledge by using a 45-item test developed by Stanovich and Cunningham (1993) to put the content knowledge into a larger context. To investigate teachers' theoretical orientation to reading instruction, the authors used the DeFord Theoretical Orientation to Reading Profile (1985). Finally, kindergarten student learning was assessed by using the Gates-MacGinitie Reading Test (1989), Level R, Form K. First and second grade students' reading achievement was assessed by the vocabulary and comprehension subtests of the grade-appropriate Gates-MacGinitie Reading Test, Wechsler Individual Achievement Test (1991) (spelling), and children's written narratives (writing fluency).

The authors found a relationship between content knowledge and instruction, and between K teachers' phonological knowledge and their students' reading achievement. Although the researchers once again asked questions regarding teacher knowledge of reading and assessed this knowledge through some well-known surveys, the scope of teacher knowledge of reading measured was still limited and did not assess teacher content knowledge in all the same areas that student knowledge was assessed.

The fourth study, that explores one small aspect of teacher knowledge of reading, was done by Cheesman, McGuire, Shankweiler, and Coyne (2009), who developed their own survey. The authors mailed their 15-item multiple-choice survey, which investigated teachers' knowledge of phonemic awareness (Survey of Teacher Phonemic Awareness, Knowledge, and Skills) to 223 first year teachers who were initially certified in special education, early childhood

education, and elementary education. Similar to Moats (1994), the study indicated that a significant number of beginning special education teachers and general education teachers do not have the knowledge needed to adequately teach phonemic awareness. While this finding is significant in that it supports Moat's (1994) findings regarding phonemic awareness, and while phonemic awareness is one of the five essential components of NRP, this survey used in this study has an even more narrow view of teacher knowledge of reading than the three surveys already discussed, and it certainly does not address the broader picture of teacher knowledge as it is framed by NRP (2000).

Fifth, the Bos, Mather, Dickson, Podhajsky, and Chard (2001) study and its associated survey, are worth noting because instead of focusing on the knowledge possessed by inservice teachers like the previous studies, they explored both the knowledge of inservice and preservice teachers. The authors collected data on preservice (*n* = 252) and inservice teachers (*n* = 286) perceptions and knowledge about early reading instruction. This data was collected using two surveys. The first survey used was the Teacher Knowledge Assessment: Structure of Language survey, a 20-item multiple-choice assessment that examined knowledge of the structure of the English language at both the word and sound levels. The second survey, a perception survey, included 15 items (six-point Likert scale) and was modeled after an instrument developed by DeFord (1985). Similar to findings from the previous studies discussed, results showed that inservice teachers were lacking in essential knowledge of reading. The study indicated that both preservice and inservice

teachers had a limited knowledge of phonological awareness and terminology related to language structure and phonics.

The last study I would like to present, Lane, Hudson, Leite, Kosanovich, Strout, Fenty, and Wright (2009), used both regular education and special education teachers as participants. The authors collected data from 11 schools in nine Reading First school districts in Florida, in order to examine the role of teacher knowledge about reading fluency in students' fluency growth. Participating K-3 teachers (*N* = 133) completed a survey (open-ended) of knowledge about reading fluency. Survey questions included the following: (1) What is reading fluency; (2) Why is it important for children to develop reading fluency; (3) What knowledge and skills do children need to become fluent readers; (4) How can reading fluency be assessed; and (5) What instructional methods could be used to develop reading fluency? Student fluency was measured using two subtests of the Dynamic Indicators of Basic Early Literacy Skills (DIBELS, Kaminski & Good, 1996). The findings indicated that teacher knowledge about reading fluency is a significant predictor of first-grade students' decoding, although effects on third-grade students' reading growth were less pronounced. Again, the survey associated with this study is important in that it assesses teacher knowledge of fluency, one of the five essential components of teachers' knowledge of reading and reading instruction as framed by the NRP (2000). However, this survey only looks at this one NRP component, fluency, and therefore, like all of the proceeding studies that have taken a narrow view of

teacher knowledge, does not give information regarding the broader picture of teacher knowledge of reading and reading instruction.

Regular education. Moving from special and regular education teachers, in this section, I will focus on eight studies that looked at the knowledge of regular education teachers. The first study assessed the knowledge of regular education teachers using a variation of the survey developed by Moats and Foorman (2003). In this four-year longitudinal study of reading instruction in low socioeconomic schools, the authors used the Teacher Knowledge Survey (TKS), which was an adaptation of the Informal Survey of Linguistic Knowledge (Moats, 1994). The purpose of the study was to determine if a relationship existed between teachers' knowledge, student achievement, and teacher competence. With that purpose in mind, data was collected through a variety of measures in addition to the TKS. Teacher competence was assessed through the use of an observation instrument, the Texas Teacher Appraisal System (TTAS) (Texas Education Agency, 1984). Students' reading achievement was assessed by the Woodcock-Johnson Basic Reading and Broad Reading Clusters assessment (Woodcock & Johnson, 1989).

Findings from the TKS survey instrument (Moats & Foorman, 2003), like that of Moats' original survey instrument (Moats, 1994), indicated a lack of teacher content knowledge in several areas of literacy (i.e., sounds, syllables, and various principles of phonics instruction). The authors asserted that due to these deficits in knowledge, teachers would not be able to make appropriate instructional choices. Again in this study, like previously mentioned in studies

done in regular and special education, the survey instrument did not look at each of the five essential components of reading and reading instruction.

Second, Cunningham, Zibulsky, and Callahan (2009) questioned whether teachers, in this case preschool teachers, possessed the necessary content knowledge to teach reading. In this case, the researchers defined and measured content knowledge of reading using a modified version of the Informal Survey of Linguistic Knowledge, created by Moats (1994). This modified instrument is referred to as the Teacher Knowledge Assessment Survey (TKAS). The 20 preschool teachers used in this study were a sub-sample of teachers who participated in a larger national study (Preschool Curriculum Evaluation Research Consortium, 2008). Preschool teachers in this study met monthly as part of a Teacher Study Group (TSG) and then received feedback following classroom observations of their literacy practices and mentoring from literacy leaders over the course of the school year. To follow up, in both the fall and in the spring, the teachers took tests of both their actual and perceived knowledge during the TSG. Similar to the findings of Moats (1994), Cunningham et al. (2009) found that preschool teachers lacked the necessary knowledge required to promote early literacy and overestimated what they do know. Therefore, this study adds to the building evidence that teachers, regardless of the grade level that they teach, lack the knowledge that they need to effectively teach reading. Once again a limitation of this study is the narrow definition of teacher knowledge used by this survey, which leads one to wonder what the findings would be if the

broader definition of teacher knowledge, the one used by NRP (2000), were used for assessment purposes.

Third, like the study done by McCutchen and Berninger (1999), McCutchen, Abbott, Green, Beretvas, Cox, Quiroga, Potter, and Gray (2002) looked at knowledge of regular education teachers and how it affects teacher practice that in turn affects student achievement. The research questions were: (1) With an instructional intervention of realistic duration, could the researchers deepen teachers' knowledge of the structural features of language, especially phonology and its orthography; (2) would the teachers the researchers worked with change the instructional techniques they used with their students, and if so what would the changes be; and (3) would students who experienced such teaching (experimental group) acquire reading and writing skills more rapidly than their peers in the control classrooms? It is important for the reader to note that the research questions make the assumption that teacher knowledge is important, and opens the door to a discussion of whether or not teacher knowledge can be developed in ways that impact the way teachers teach in their classrooms.

To answer their three research questions, McCutchen et al. (2002) worked with kindergarten and first grade teachers who were enrolled in a 2-week summer institute. They taught the teachers the importance of explicit instruction in phonological and orthographic awareness. To assess the teachers' knowledge of the structure of language, the authors used the Informal Survey of Linguistic Knowledge (Moats, 1994; Moats & Lyon, 1996). Student learning was

assessed multiple times throughout the school year (Sept., Nov., Feb., and May), using the Test of Phonological Awareness (TOPA), Metropolitan Readiness Tests (MRT6—comprehension), a timed alphabet writing test, and the Gates-MacGinitie Reading Test (word reading). McCutchen et al. reported the following three findings: (1) it is possible to deepen teachers' own knowledge of the role of phonological and orthographic information in literacy instruction; (2) teachers can use this new knowledge to change classroom practice; and (3) these changes in teacher knowledge and teacher practice in the classroom can improve student learning. These findings from McCutchen et al. indicate that teachers can develop deeper, richer content knowledge of reading than what they had acquired before they started teaching, and that this knowledge can positively impact their students' achievement. While these findings are helpful in laying a foundation for a developmental model of teacher knowledge in that initial teacher knowledge can be built upon, and the new knowledge can positively affect how teachers teach. However, once again the survey instrument that was used only assessed a very narrow aspect of teacher knowledge of reading and reading instruction and the effects of teacher experience.

The fourth study, done by McCutchen, Green, Abbott, and Sanders (2009), is similar to the earlier study done by McCutchen et al. (2002), in that it also used the Informal Survey of Linguistic Knowledge (Moats, 1994). Although, in this study, the authors worked with third, fourth, and fifth grade teachers (N = 30) during a 10-day institute, focused on literacy instruction and related linguistic knowledge, and then assessed student (N = 718) learning across the year. Once

again the researchers were looking at whether or not their intervention, resulted in increases in teacher knowledge (see also McCutchen & Berninger, 1999; McCutchen et al., 2002). Intervention teachers' pre- and postinstitute scores on the survey indicated that teachers significantly increased their linguistic knowledge after their experiences in the summer institute. In addition, teachers' linguistic knowledge, as measured by the survey instrument, was related to improved student performance, regardless of condition. Analysis of all students (*N* = 718) indicated that the benefits for the lower performing students were shared by higher performing classmates but to a more limited extent. Again, a limitation of the study was that the survey only assessed the linguistic knowledge of teachers and did not address the five essential components of teacher knowledge of reading and reading instruction, as indicated by the NRP (2000).

Unlike the previous four studies, Brady, Gillis, Smith, Lavalette, Liss-Bronstein, Lowe, North, Russo, and Wilder (2009) did not modify Moat's (1994) popular survey instrument; instead, they developed a new survey, The Teacher Knowledge Survey (TKS), to examine teacher knowledge. In their study, the authors also used a second survey, the Teacher Attitude Survey (TAS). The purpose of this study was to look at the efficacy of intensive professional development for building the knowledge of first-grade teachers (*N* = 65) in the areas of phoneme awareness (PA) and phonics (P). In addition to an introductory 2-day summer institute and monthly workshops, the professional development featured frequent in-class support from highly knowledgeable mentors for one school year. Pre- and postknowledge of phonological

awareness and phonics concepts prior to professional development were assessed using the TKS. Prior to receiving any training on PA, participants on average were 38% correct on PA section of the TKS; on the P portion of the TKS, the average performance was 48%. At the end of the year, after training, participants on average had increased to 70% on the PA section of the TKS, and to 80% for the P section. This study, like the two previously mentioned studies, indicated that teachers could increase their knowledge of essential components of reading and reading instruction (i.e., phonemic awareness and phonics) by doing something as simple as attending a 2-day summer institute. Although teacher content knowledge was shown to change in a positive manner, it was not clear whether this reported change in teachers' content knowledge was changing in either depth or in breadth. Like the studies mentioned previously, that have used surveys, this study does not attempt to measure all five NRP (2000) essential components of teacher knowledge.

Sixth, Cunningham and Stanovich (1990) developed the Title Recognition Test (TRT), which has been used to explore teacher content knowledge of reading, specifically teachers' knowledge of children's literature. The TRT originally was developed as a "proxy measure of print exposure" (Cunningham & Stanovich, 1990, p. 735). Participants in the original study that used this survey included 51 third-grade students and 47 fourth-grade students. The TRT consisted of a total of 39 items: 25 actual children's book titles and 14 foils for book names. The 25 titles were selected from a sample of book titles generated in pilot investigations, with groups of children ranging in grade level from second

grade through high school. The authors report that it is likely that the "TRT is a brief test that taps into these enormous differences in exposure to print outside of the classroom, and the results presented here indicate that such print exposure differences can have very specific effects on orthographic processing efficiency" (Cunningham & Stanovich, 1990, p. 739).

In the present context, the TRT was not being used as it had been initially intended. Instead it was being used because of its subsequent, repeated use to assess teacher content knowledge (Cunningham, Perry, Stanovich, & Stanovich, 2004), specifically, teachers' knowledge of children's literature. For example, Cunningham, Perry, Stanovich, and Stanovich (2004), the seventh study in this discussion, used two well-known surveys and a third survey to pretest primary grade teachers knowledge of children's literature, phonological awareness, and phonics as part of a professional development institute. These surveys included the Title Recognition Test (TRT) (Cunningham & Stanovich, 1990, 1991), the Phonological Awareness Knowledge (Moats, 1994), and Phonics Knowledge (explicit & implicit).

The participants in the study consisted of 722 kindergarten through third-grade teachers who were enrolled in a summer institute run by the authors. The teachers represented 48 elementary schools in a large urban school district, and the average years of teaching experience for the group was 11.97. The findings indicated that while teachers demonstrated limited knowledge of children's literature, phoneme awareness, and phonics, the majority of these teachers evaluated their knowledge levels quite positively. According to Cunningham,

Perry, Stanovich, and Stanovich (2004), teachers appeared to have some ability to estimate their own knowledge levels in the area of children's literature, yet had little ability to estimate their own knowledge in the areas of phoneme awareness and phonics.

The findings of this study in regard to phonological awareness were consistent with the findings of other studies: teachers had relatively low levels of knowledge of phonological awareness. Results indicated that only 30% of the teachers could correctly identify the correct number of phonemes in half the words on the survey. Also concerning was the finding that 20% of the teachers could not identify the correct number of phonemes in the words on the survey list. Although phoneme segmentation is an integral component of many basic reading programs, these survey findings indicate there are teachers who themselves are unable to perform the skills they are expected to teach.

The findings regarding phonics indicated that only 28% of the teachers were able to answer half of the survey items correctly on the explicit phonics. In addition, only 1% of teachers were able to answer all survey items with 100% accuracy. Because these tasks were designed to demonstrate teachers' content knowledge of phonics, results indicate that these teachers may be unable to adequately teach and explain these concepts to their students. Therefore, the assumption can be made that overall, the majority of these teachers would not have the necessary knowledge to adequately address phonological awareness, phonics, and children's literature in reading instruction.

The last study in this section on regular education teachers was done by Al-Hazza, Fleener, and Hager (2008), and it is a replication study of Cunningham, Perry, Stanovich, and Stanovich (2004). The one significant difference between the Al-Hazza et al. study and that of Cunningham et al. was the use of demographic information to categorize the participants. The 141 full-time teachers who participated in the study were administered a three-part survey that consisted of two parts that assessed the same information as the Cunningham et al.'s study, but the third part assessed demographic information on the teachers. The addition of this demographic information allowed the researchers to question if there were differences in the knowledge levels of new and experience teachers.

Findings indicated that a majority of K-3 teachers were not familiar with terminology such as phonemes, digraphs, consonant blends, and graphemes, and their knowledge of phonological awareness was weak. The authors found that even teachers who rated themselves as expert or proficient in phonological awareness had low overall scores (approximately 58% correct); however, those who rated their knowledge as high did have an overall higher mean score. Also, there was no significant difference between new teachers' mean survey scores and experienced teachers' mean survey scores, demonstrating that overall, teachers did not have the required knowledge to adequately teach phonological awareness. Although the findings are not encouraging with regards to teacher knowledge being developmental, this study marks an important change in questions posed by researchers regarding teacher knowledge and teacher

experience, indicating that there may be a link between the two variables. However, it should be noted that this study still did not take a broad view of what constitutes teacher knowledge of reading and reading instruction, as framed by NRP (2000).

Special education. Three studies conducted with special education teachers as participants, when looked at together, also indicate researchers' awareness of a possible link between the two variables teacher knowledge and teacher experience. In these three studies, the authors choose to study participants with varying degrees of teaching experience to explore the developmental nature of teacher content knowledge of reading.

For instance, in their first study, Spear-Swerling and Brucker (2003) examined both preservice and in-service special education teachers' knowledge about word structure after they had completed a college course. The authors gave both groups of teachers three assessment tasks: graphophonemic segmentation (GS), classification of pseudowords by syllable type (ST), and classification of real words as phonetically regular or irregular (IW). The 90 participants in the study were divided into three groups. Groups 1 and 2 were the experimental group that received instruction on word structure. Group 3 was the control group. All three groups were pre-tested and post-tested on the three assessment tasks (GS, ST, and IW). The authors noted that their findings were similar to findings of previous research (e.g., Bos, Mather, Dickson, Podhajski, & Chard, 2001; McCutchen, Abbott, et al., 2002; McCutchen, Harry, et al., 2002b) that indicates both preservice and inservice teachers often do not have sufficient

knowledge about word structure needed to implement the kinds of research-based recommendations made by the National Reading Panel (2000). The findings regarding teacher knowledge at the preservice and inservice stages of teacher development are consistent with studies previously mentioned in this chapter.

In their second study of teacher content knowledge of literacy, Spear-Swerling and Brucker (2004) used only novice teachers (*N* = 147) as participants. This study examined the word-structure knowledge of novice teachers and the progress of children tutored by various subgroups of the teachers. Teachers were in one of three groups: Group 1 consisted of novice teachers enrolled in a special education course on teaching language arts to individuals with special needs in which information about English word structure and phonics was taught, and they did supervised tutoring of students at a local elementary school; Group 2 consisted of novice teachers who received the same course content involving word structure and phonics as Group 1, but they did not do supervised tutoring; and Group 3 consisted of novice teachers who were taking a special education course that did not cover phonics, reading, or language arts topics.

Novice teachers' word-structure knowledge was assessed using three tasks: graphophonemic segmentation, classification of pseudowords by syllable type, and classification of real words as phonetically regular or irregular. Tutored children were assessed on several measures of basic reading and spelling skills. Novice teachers who received word-structure instruction outperformed a comparison group of teachers in word-structure knowledge at posttest. Tutored

children improved significantly from pretest to posttest on all assessments. Teachers' posttest knowledge on the graphophonemic segmentation and irregular words tasks correlated significantly with tutored children's progress in decoding phonetically regular words; error analysis indicated links between teachers' patterns of word-structure knowledge and children's patterns of decoding progress. This study by Spear-Swerling and Brucker (2004) suggests that word-structure knowledge is important in effective teaching of word decoding, and that existing teacher content knowledge can be further strengthened or developed with additional instruction and practice. In other words, existing teacher content knowledge can be increased, and students benefit from the additional knowledge that teachers have acquired even though teacher knowledge in this instance is narrowly defined.

In their third study, Spear-Swerling, Brucker, and Alfano (2005) investigated only graduate teacher education students. In this study, graduate teacher education students rated their own literacy-related knowledge in three areas (knowledge about reading/reading development, phonemic awareness/phonics, and morpheme awareness/structural analysis). After rating their knowledge levels, the preservice teachers completed five tasks intended to measure their actual disciplinary knowledge in these areas. The five tasks included: (1) a general knowledge measure involving open-ended questions about reading and reading development; (2) a task requiring specification of the number of morphemes in words; (3) a graphophonemic segmentation measure; (4) a task requiring classification of pseudowords by syllable type; and (5) a

measure requiring identification of the phonetically irregular words in a set of common words. Teachers with high levels of prior background (i.e., course preparation and experience) rated themselves as significantly more knowledgeable as low prior knowledge background teachers in all areas; high-background participants also significantly outperformed the low-background on all tasks. However, even high-background participants performed well below ceiling (proficiency level) on the tasks. Regression analysis indicated that pre-service teachers' self-perceptions and knowledge were positively related to both levels of preparation and teaching experience. Teachers had some accurate perceptions of their own knowledge, especially in the area of phonics. The authors contend that their results indicated that differentiating levels of preparation may be useful in studying teacher knowledge, a suggestion that would contribute empirical evidence to our understanding of a developmental model of teacher knowledge of reading and reading instruction. The authors' findings also support the notion of a substantial gap between research on reading and teacher preparation in reading, a notion that is supported by this literature review.

Conclusion of content knowledge of reading. In conclusion, we know that in their attempt to capture a clearer picture of teacher knowledge, researchers have moved from gross assessments of teacher knowledge (proxies) to more fine grain assessments of teacher knowledge (surveys). Gross assessments of teacher knowledge were instrumental in determining that teacher knowledge is important with regards to student achievement. Fine grain assessments of

teacher knowledge, namely surveys, were instrumental in focusing attention on the deficits in some areas of teacher content knowledge. The results of the body of research that employs fine grained assessments suggests three things regarding content knowledge: (1) teachers in both regular and special education appear to have inadequate content knowledge as defined in the aforementioned studies (i.e., spoken and written forms of the English language); (2) professional development opportunities provided for regular and special education teachers appear to have the potential to increase teachers' content knowledge; and (3) fine-grained surveys have focused on only a few of the five essential component areas (i.e., phonemic awareness, phonics, fluency, vocabulary, and text comprehension) that have been identified by the NRP, thereby giving an incomplete picture of what preservice and inservice teachers know.

In shifting the research focus from more gross grain to more fine grain assessments of teacher knowledge, researchers have brought increased attention to the need to define the knowledge base for teacher content knowledge of literacy/reading (Carlisle, Correnti, Phelps, & Zeng, 2009). The fields' historic lack of consensus on what constitutes content knowledge of reading is mirrored in the types of surveys used in the aforementioned studies. The field needs to decide whose perspective of content knowledge of reading (e.g., formal linguists, social linguists, historical linguists, cognitive psychologists) will determine what constitutes domain knowledge of reading instruction.

At this time, however, NRP (2000) has established, arguably, a professional consensus of best practices in reading that can be used as a

framework for what should constitute a content knowledge base for reading, and that is a good start. In fact, Snow et al. (2005) argued that the "lack of a fully specified research base" (p. 2) should not "discourage us regarding the value of what we do know" (p. 2). Therefore, by using this good start provided by NRP and the associated rich knowledge base we are able to instruct preservice teachers in the necessary content knowledge allowing them to enter the teaching profession. It is likely that preservice programs are either not able to or do not deliver all the content knowledge necessary for teaching to preservice teachers. This notion is echoed by Snow et al. who contend that even though teachers may have met certification requirements, teachers may have areas of knowledge that "might have been skimped on in their preservice programs" (p. 5) or over time they may have a need to become "acquainted with newly emerging research findings" (p. 5). Thus, developmental models of teacher knowledge allow for the continued development of knowledge that includes content knowledge. It is this good start regarding what constitutes content knowledge provided by NRP.

The researchers who developed the LIKS-WS have capitalized on the NRP's definition of content knowledge and in the construction of the LIKS-WS have included all five identified areas. This is a large improvement over previous surveys, which make the LIKS-WS a superior survey instrument for assessing teacher content knowledge in phonemic awareness, phonics, fluency, vocabulary, and text comprehension.

Pedagogical Content Knowledge

Shulman (1996b) introduced the concept of pedagogical content knowledge, which is essential for teaching by pointing out that "mere content knowledge is likely to be as useless pedagogically as content-free skill" (p. 8). Shulman (1986b) described pedagogical content knowledge as "the most useful forms of [content] representation . . . the most powerful analogies, illustrations, examples, explanations, and demonstrations—in a word, the ways of representing and formulating the subject that makes it comprehensible for others" (p. 9). The truth of Shulman's statement can be seen in studies that explore the experiences of first year teachers who, after spending years making good grades in college and finally graduate, suddenly come to the realization that they need to be more than just content matter specialists; they also needed to have an understanding of how to make a specific topic or content matter comprehensible to their students (Bullough, 1989; Gess-Newsome, 1999). In other words, they need pedagogical content knowledge.

Having sufficient pedagogical content knowledge allows teachers to be able to answer questions such as: What should I do with my students to help them best understand this concept? What materials are available to help me teach this concept? What are my students likely to already know about this concept and what will be difficult for them? How can I best assess what my students have learned? (Bailey, 2010; Magnusson, Krajcik, & Borko, 1999). Put differently, pedagogical content knowledge is reflected in how teachers implement content-specific representations of knowledge in ways that maximize

student learning, something that first year teachers often find difficult and experienced teachers do masterfully.

Because research on pedagogical content knowledge has only been conducted for the past 25 years, there is a limited amount of research on it. However, the term pedagogical content knowledge has been widely used in a variety of content areas (e.g., English, history, mathematics, reading), and through this use it has become apparent that the concept pedagogical content knowledge as it was envisioned by Shulman is a broad concept. For example, researchers have used pedagogical content knowledge to refer to a wide range of aspects of the teaching of content matter and, in fact, have used it differently both across and within subject areas (Ball, Thames, & Phelps, 2008; Cochran, DeRuiter, & King, 1993; Harris & Hofer, 2011; Mishra & Koehler, 2006). Because there is a much more limited research base of pedagogical content knowledge than there was on content knowledge of reading, the best way to access what is known about this type of teacher knowledge is to look briefly at the literature in different content areas before focusing on reading. With that reason in mind, the following is a brief overview of research that has been done in English, history, mathematics, and ultimately reading. It should be noted that these studies were conducted in regular education.

English. Grossman (1989) and Gudmundsdottir (1991) conducted case studies that found differences in the pedagogical content knowledge of secondary English teachers based on their undergraduate course work. Both authors examined the knowledge of teachers who either had graduated from

formal teacher education programs or those who did not graduate from teacher education programs but had instead majored in English as part of their study. Both Grossman and Gudmundsdottir noted that even though both groups of teachers appeared to have similar levels of knowledge of English as a content area, their ability to convey this knowledge to their students was markedly different as well as their ability to assess their students understanding of the content. For example, the teachers who graduated from formal teacher education programs had explicit model of English that they were then able to subsequently teach their students, thus providing their students with a framework to scaffold their understanding of literature. They were also able to assess their students understanding of the content. In comparison, the teachers who were English majors found their implicit models a hindrance when it came to making the text accessible to their students. In addition, they had difficulty understanding what their students knew and often referred to assessment as their "biggest problem" (Grossman, 1989, p. 28).

According to which group they were in, teachers also differed in how they actualized differences in their levels of pedagogical content knowledge as it relates to knowledge of content and students, The teachers who graduated from a teacher education program appeared to choose material based on their knowledge of the students and the content. This was most apparent by their questions when asked to plan a course. The teachers' questions focused on student need: Is it a remedial course? Is it a college preparatory course? What should the focus of the course be? In comparison, the teachers who were

English majors did not focus on the academic needs of their students, but instead expressed concern about their students' interests. Additionally, the course curriculum selected by the teachers who graduated from a teacher education programs indicated a broad, comprehensive understanding of English knowledge, whilst the teachers who were English majors appeared to choose literature that they themselves found interesting for their course content. Given these findings, the researchers pointed out teachers who had majored in English might be considered content specialists but they clearly lack pedagogical content knowledge, while formal teacher education programs provided teachers with the necessary pedagogical content knowledge required for teaching. It is unclear from these studies whether the effects of teacher education programs were due to the perspectives of the content of English conveyed to preservice teachers or if teacher education programs either directly taught pedagogical content knowledge to their students, or gave their students the experiences they needed to develop pedagogical content knowledge.

History. Similar to findings in English, research on teacher knowledge of history found pedagogical content knowledge differed in teachers according to their undergraduate course work. For example, Wilson and Wineburg (1988) investigated the role of teacher content knowledge and how this knowledge affected teachers' pedagogical content knowledge of history. The researchers investigated the knowledge of four history teachers. The undergraduate academic backgrounds of all four teachers were markedly different but included the following four common academic perspectives: American studies,

anthropology, political science, and American history. The purpose of Wilson and Wineburg's study was to explore how the teaching of an American history class is affected by varying academic perspectives.

Wilson and Wineburg discovered that the academic backgrounds of each of the teachers had a distinctly different influence on their perspective of the course content and ultimately their pedagogical content knowledge. Their different pedagogical content knowledge was seen by their instructional decision making for the history course. For instance, Jane, the history major, believed that facts form a story of the past should be viewed as a narrative. In contrast, Fred, a political science major, had the perspective that the content knowledge of history was facts. To put it another way, history was comprised of numerous dates of historical events. Not surprisingly, the teachers' perspective of history influenced many of their instructional choices, curricular choices as well as the manner in which they perceived and analyzed the information presented in the course textbook and the questions they posed to their students. In essence, teachers' academic backgrounds and their associated perspectives influenced their pedagogical content knowledge, how they chose the most important illustrations, examples, and how they explained the various historical events.

Wineburg and Wilson (1991) conducted another study in which 11 secondary history teachers were observed and interviewed in order to explore the role of the "wisdom of practice" (p. 7) or pedagogical content knowledge in teaching. Similar to the findings of their first study, the authors found that content knowledge had a direct influence on teachers' pedagogical content knowledge; in

other words, it influenced both what teachers chose to teach and how they chose to teach it. The authors, through interviews and classroom observations, documented the teachers' transformation of content knowledge into pedagogical content knowledge by their choices of instructional representations (e.g., choices of examples, demonstrations, stories, analogies). Teachers were observed making one of two representations: (1) *epistemological representations* that "model the ways of knowing in a given domain, exemplifying how knowledge is constructed and inquiry pursued" (p. 333), or (2) *contextual representations* that "represent specific concepts, ideas, and events that, while bearing on other contexts, are rooted in a specific time and place" (p. 333). The authors note that these representations are not mutually exclusive. The authors also noted the caution teachers needed to exercise in their attempts to present their comprehension of content knowledge with the understanding of the needs, motivations, and abilities of their students. At one end of the spectrum teachers risk misrepresenting complex content matter by oversimplifying and on the other end they risk adding too much complexity to an already difficult topic. Without the necessary pedagogical content knowledge, teachers may hinder students learning.

Mathematics. Carpenter, Fennema, Peterson, and Carey (1988) explored first grade teachers' (N = 40) pedagogical content knowledge of mathematics. Specifically, the authors examined the teachers' understanding of how students think about addition and subtraction in word problems and teachers' knowledge of their own students' thinking. It is interesting to note that

the average number of years of teaching elementary school for the teachers in the sample was 10.90, and the average number of years of teaching first grade was 5.62. Only two of the teachers in this study were in their first year of teaching. The authors determined that the majority of the teachers in this study did not have the necessary pedagogical content knowledge, specifically, a coherent framework for classifying word problems, and therefore were unable to articulate the distinctions between problems using mathematical reasoning. Given their insufficient pedagogical content knowledge of mathematics, the teachers were handicapped in their assessment of students' misconceptions related to problem solving, and therefore were not able to adequately meet their students' instructional needs.

Various aspects of teachers' pedagogical content knowledge of mathematics teaching have been investigated by other researchers. For example, Ball (1993) and Lampert (1985) have examined their own classroom teaching as one method of investigating the knowledge that teachers need for teaching. After an analysis of their own teaching, Ball and Lampert both independently concluded that knowledge of the content (i.e., mathematics) was not sufficient for effective teaching; they also needed pedagogical content knowledge (i.e., knowledge of how to represent content, understanding children as thinkers, and understanding learning communities). To be able to teach their students, each author had to choose a number of representations to present that would empower their students to grasp the pertinent mathematical concepts. For instance, Ball needed to determine how to teach the concept of negative

numbers to her class of third-grade students using representations they would understand. First, she chose the representation of a building with many floors, both above and below ground level. When some of Ball's students were still not able to grasp the concept of negative numbers, she tried using the example of money (and debt) to represent the concepts. Other representations of negative numbers that Ball considered but did not use were game scoring and below zero temperatures (something her Michigan students were familiar with). Ball's ability to make these choices was based on her pedagogical content knowledge, that included her knowledge of her students' multiple representations of the concept and understanding of learning communities (in her classroom).

Both Lampert (1985) and Ball (1993) held the belief that a teachers' knowledge must go beyond the necessary content knowledge for performing mathematical operations and included pedagogical content knowledge. A common example used to demonstrate this belief is the concept of fractions, one of the most difficult topics in elementary mathematics (Leinhardt & Smith, 1985). Teachers' who have considerable content knowledge but limited pedagogical content knowledge may teach division of fractions to their students by simply telling them to "invert and multiply," that may enable students to perform the function of the division of fractions, and subsequently solve the problem. However, by simply telling students to "invert and multiply," teachers will not necessarily promote students' conceptual understanding of the division of fractions. Thus, having limited pedagogical content knowledge may indicate that teachers cannot present needed representations of concepts to their students

that will enable the students to develop a deep understanding of the concept (Ball & Bass, 2000). In other words, a mathematician may have a great deal of content knowledge but not be good at teaching mathematics to students because of a lack of pedagogical content knowledge.

Similar conclusions regarding the type of knowledge that mathematics teachers need to effectively teach have been made by other researchers. Hill, Schilling, and Ball (2004) believed that "knowledge for teaching mathematics consists of more than the knowledge of mathematics held by any well-educated adult" (p. 28). Therefore, the authors, in effort to develop measures of teachers' mathematics knowledge for teaching pedagogical content knowledge, developed a multiple-choice survey that included questions that were qualitatively different from the typical mathematical competency exam. For example, survey questions required teachers to demonstrate their ability to both diagnosis mathematical errors made by students and their ability to provide instructional intervention based on analysis of these errors. The authors found that teachers' knowledge for teaching elementary mathematics is multidimensional, and includes more than just knowledge of various mathematical topics (e.g., number and operations, algebra), it also includes what is referred to in this dissertation as pedagogical content knowledge.

In another study, Leinhardt and Greeno (1986) investigated mathematical pedagogical content knowledge of both preservice teachers and experienced teachers (5+ years). The authors examined ten activities that occurred in both novice and experts daily lessons: presentation and review,

shared presentation, drill, game drill, homework, guided practice, monitored practice, tutoring, test, and transition. The findings of their study indicated a difference in the pedagogical content knowledge of novice and experienced teachers. For example, experienced teachers used flexible routines in all aspects of their daily lessons that allowed them the opportunity to focus on student understanding and adapt their teaching to the needs of their students. In contrast, the majority of novice teachers did not work in a routine or habitual way, so each activity of a lesson was different from the next and the structure of each day was different. The novice teachers had to take time and energy to explain each activity and each days' structure thus they spent less time focused on student understanding and adapting their teaching in meaningful ways to further their students understanding of mathematics. Thus, this study not only indicates teachers have pedagogical content knowledge, but pedagogical content knowledge varies according to the level of experience possessed by the teacher.

The last study of pedagogical content knowledge of mathematics explores how pedagogical content knowledge develops in teachers. Baily (2010) conducted a 3-year longitudinal study that investigated the impact of standards and research-based teacher training on the pedagogical content knowledge of six second grade and seven third grade teachers of mathematics from nine schools within one failing school district. The teachers in this study participated in professional development activities during a five day course intended to increase teachers' knowledge of second and third grade content standards and the associated mathematical pedagogy. The authors' pre- and

post-tested teachers' levels of content and pedagogical content knowledge of mathematics using a survey instrument. They also conducted focus group sessions to monitor changes in teacher knowledge. Qualitative and quantitative data revealed that the impact of standards and research-based teacher trained led to significant gains in teachers' mathematics pedagogical content knowledge at both grade levels

Teacher pedagogical content knowledge of reading. At this time, there is little research on pedagogical content knowledge of teachers in the area of reading and reading instruction. Again, like previously mentioned in the section on content knowledge of reading, it would be logical to organize a review of these studies according to the five essential components of NRP (2000), phonemic awareness, phonics, fluency, vocabulary, and comprehension. However, there are simply not enough studies in each of these individual areas to organize the review in this manner. In fact, there are not enough studies on pedagogical content knowledge of reading to organize the studies by the same three groupings as was done in the content knowledge of reading section: (1) regular and special education, (2) regular education, and (3) special education. Therefore, the proceeding section includes three studies, which use survey instruments to explore elementary school teachers' pedagogical content knowledge of reading.

First, Rowan, Schilling, Ball, and Miller's (2001) study and its associated survey are relevant to this discussion for two reasons. First, this is one of the few survey instruments that currently exist that examines pedagogical content

knowledge of reading. Second, researchers assert that although challenging, it is possible to develop a multiple-choice survey instrument that can measure pedagogical content knowledge of reading, a thought that is echoed by the LIKS-WS research team that developed the survey used in this dissertation.

The authors sent 123 elementary school teachers in Michigan and Texas self-administered questionnaires during the summer and fall of 1999. After three mailings, 104 of these teachers returned completed questionnaires, for a unit response rate of 84.5%. All of the teachers held elementary teaching certifications and all grade levels taught were roughly equally represented. About half the teachers held advanced degrees in education or another field, and about half the teachers had been teaching for 15 years or more.

Rowan et al. reported mixed results in constructing reliable scales measuring teachers' pedagogical content knowledge. One difficulty the authors' encountered in writing the survey items was developing items and scenarios that adequately tapped the full range of underlying "levels" of teachers' pedagogical content knowledge in the various domains studied. A second problem the authors' had while constructing survey items was writing items and scenarios that provided clear and sufficient information for the participants. Despite the two reported problems, the authors discussed the idea that certain facets of teachers' pedagogical content knowledge could be measured with as few as 6 - 10 survey items. Regardless of the problems and the associated limitations reported in this study, this study is important because it lays the foundation for proceeding surveys that explore pedagogical content knowledge of reading.

Second, Phelps and Schelling (2004) adapted select items from the survey developed by Rowan et al. (2001) to construct their survey. Phelps and Schelling's new survey instrument was called Content Knowledge for Teaching Reading (CKTR). The CKTR survey contained 77 items and was administered to 599 teachers who participated in the summer 2002 California Professional Development Institutes. In their analysis of the survey, the authors posed two questions: (1) What dimensions effectively characterize content knowledge for teaching reading, and (2) Is it possible to develop reliable measures of these dimensions?

In answering the first question, the authors determined that there were "three preliminary distinctions" in content knowledge for the teaching of reading as measured by the CKTR survey: knowledge of content (KC), knowledge of students and content (KSC), and knowledge of teaching and content (KTC). The primary difference between items in each of these categories is "how content knowledge is related to the work of teaching" (Phelps & Schelling, 2004, p. 36). Because the authors indicate that the differences between categories involves *how the knowledge is related to the work of teaching*, I would argue that what the CKTR measures is not merely content knowledge, but also, in large part pedagogical content knowledge as it is defined in this dissertation. This is particularly true in the case of knowledge of content and students (KCS) and knowledge of teaching and content (KTC).

In response to the second question, the authors did find that items could be used to generate reliable measures for each of the three factors (KC, KTC,

KSC) with limitations. One limitation of this study that was also a limitation of the studies reviewed in the earlier section on content knowledge of reading was that the survey items did not address all the facets of pedagogical content knowledge for teaching reading. Another limitation was that the instrument needed to be further assessed for the validity of the items to better understand the types of knowledge teachers need to use to answer the items on the CKTR survey. Despite its limitations this study and its survey were significant in that it laid the ground work for the possible development of other surveys that assess PCK for reading.

In the previous two surveys (Rowan et al., 2001; Phelps & Schelling, 2004), the participants were inservice teachers; in Phelps (2009), participants included both experienced elementary teachers who taught reading and adults who had never taught reading. Phelps (2009) used the CKTR to measure content knowledge (CK), knowledge of content and students (KCS), and knowledge of content and teaching (KCT). The questions on the CKTR focused on two broad topic areas: (1) comprehension (CMP), and (2) word analysis (WA). These two topic areas (CMP and WA) and three types of content knowledge (CK, KCS, and KCT) form a two by three matrix that makes six domains of content knowledge for teaching reading.

The author reports that there were significant differences between teachers and nonteachers for items that assessed KCS and KCT, the two types of knowledge that I argue are not really representative of content knowledge but pedagogical content knowledge as it has been defined for this dissertation. One

interesting finding from this data set is that there were several CK questions that were consistently missed by the nonteacher group. This finding warrants further empirical research on whether or not there are some aspects of content knowledge of reading that are no longer common knowledge for a literate adult due to their level of expertise as readers, thus causing those areas that were once considered content knowledge of reading to be re-categorized as pedagogical content knowledge. The findings from this study indicate that elementary reading teachers hold special knowledge of language, text, and reading processes that differ substantially from common reading and verbal ability of adults who are not teachers.

Conclusion of pedagogical content knowledge. One area of the teacher knowledge research that has received widespread attention in the past few decades is pedagogical content knowledge. The term pedagogical content knowledge (PCK) was coined by Lee Shulman and his colleagues in the late 1980s. Since that time, the term pedagogical content knowledge has been widely used (e.g., English, history, mathematics, reading), and through this use it has become apparent that the concept pedagogical content knowledge, as it was envisioned by Shulman, is a broad concept. A broad overview of research done in English, history, mathematics, and reading provides insight into the manner in which pedagogical content knowledge of teachers has been conceptualized and studied within each of these content areas. This overview indicates two things: (1) teachers' pedagogical content knowledge is influenced by both their perspective of the content area they are teaching as well as their content

knowledge, and (2) initial empirical findings support the belief that pedagogical content knowledge is a special type of knowledge possessed by teachers (Phelps, 2009).

Because pedagogical content knowledge is influenced by both teachers' academic perspectives and their content knowledge, it is reasonable to assume that pedagogical content knowledge is a more complex form of knowledge than content knowledge and is potentially a factor in how teacher knowledge develops over time (Snow et al., 2005). According to Snow et al., content knowledge would be "declarative" knowledge, and pedagogical content knowledge would be higher levels of knowledge (i.e., situated, stable, expert, reflective). In general, research on pedagogical content knowledge has explored the knowledge of secondary teachers, although some studies have considered the pedagogical content knowledge of elementary teachers. At this time, the research literature on pedagogical content knowledge of reading is quite thin.

Teacher Experience

Teachers' years of experience, that is, their years of contractual teaching experience, are considered a relevant factor in educational human resource policies, which include compensation, benefits, and promotion decisions. The underlying assumption regarding experience is that over time the knowledge, skills, and productivity of teachers is enhanced. In fact, one might argue that in education, teacher experience is the most important factor in personnel policies that affect teachers. Given the level of importance attributed to teacher

experience, researchers have challenged the assumptions made about teacher experience by asking questions such as, do students have higher levels of achievement when taught by more experienced teachers, and what is the relationship between experience and teachers level of productivity (Rice, 2010)?

To answer these questions researchers have done numerous studies during the past 40 years that have examined teacher experience (e.g., Goe, 2007; Rice, 2003, 2010). My goal is not to present a comprehensive examination of all the studies, (e.g., Nye, Konstantopoulos, & Hedges, 2004). Instead, my goal is to present the patterns gleaned from this large body of research.

With this goal in mind, I first will discuss several research syntheses that have looked across studies to present a broad overview of the research on teacher experience. Then, I will discuss how some research studies in the general educational literature (i.e., expert-novice studies) enrich our understanding of teacher experience. Finally, I will discuss three research studies that explore teacher experience in reading instruction.

Research Synthesis

Hanushek (1997), in the analysis of 207 studies, found that only 29% showed statistically significant and positive results concerning the impact of experience on teacher quality, 5% were statistically significant and negative, and 66% were not statistically significant. However, is not clear from Hanushek's findings whether the studies he reported were actually designed to find the effect of teacher experience on student achievement, what other variables were also

measured in the studies, or how teacher experience was measured in the studies. Still, given research findings like these, it was believed for some time that teacher experience was not reliably predictive of student achievement.

More recent analyses of research studies has cast doubt on Hanushek's (1997) findings by concluding that teacher experience is, in fact, related to student achievement (Goe, 2007; Rice, 2003, 2010), and the problems of finding more consistent patterns in the research could be due in part to the how the variable of teacher experience was measured and the statistics that were used to analyze the data. For example, Rice (2003) states that

> Another explanation for the inconsistent evidence on teacher experience is the way this variable has been used in studies. Many analyses have included teacher experience as a control variable in models testing the effect of other variables on student achievement. Typically these studies enter experience as a single, continuous variable and find no evidence of a linear relationship between teacher experience and their effectiveness. On the other hand, studies that focus on teacher experience as the key independent variable (i.e., the treatment) have found that nonlinear models are far more likely to capture an effect for this variable. Consequently, this review considers only those studies that explicitly measure teacher experience as a key treatment; these analyses are designed to ascertain the non-linear effect of experience on teacher effectiveness. (p. 17)

Therefore, Rice (2003) also analyzed empirical research regarding teacher experience as one aspect of teacher quality, but in a different manner than Hanushek (1997). Rice analyzed studies that were conducted over a 30-year period (1969 - 1999). Based on her analysis, Rice drew several conclusions. First of all, the analysis of the research indicated that there is a positive relationship between teacher experience and student achievement. At the elementary level, this relationship is most evident during the first several

years of teaching. However, there was some evidence that positive effects reemerged among very experienced teachers (more than 14 years), that Rice refers to as “vintage effects.” Also, it is possible that more experience may be of greater importance for high school teachers than it is for teachers of younger students.

The importance of teacher experience was also analyzed in Goe’s (2007) more recent synthesis that looked at studies primarily conducted between the years 2000 - 2007. After analyzing the research, Goe reported findings that echo the earlier findings of Rice (2003), that is, teacher experience does indeed matter to student achievement. Goe also indicates “teachers reach their peak performance by increments within the first four or five years of teaching” (p. 48). During this time period, teachers appear to gain in effectiveness (contribute to student achievement scores) but then level off, which means that years of experience beyond the fifth year contribute little or no additional benefit to student achievement. The analysis of the numerous studies reviewed by both Rice and Goe lends credible empirical support to the assumption that teacher experience does indeed matter, if not across all years of teaching but certainly within the first several years of teaching.

In her most recent analysis of the existing research, that includes studies from 2007 - 2009, Rice (2010), presents four key findings regarding teacher experience: (1) the impact of teacher experience is strongest during the first few years of teaching experience; (2) the positive effect of early-career teaching experience varies according grade-level taught and subject matter (strongest and

most consistent at the elementary and middle school levels and in the area of mathematics); (3) teachers with less than three years of teaching experience are more likely employed in high-poverty schools; and (4) the difference in teacher quality between high and low poverty schools was attributed to lower productivity returns of inexperienced teachers in high poverty schools. In essence, Rice (2010) reports that the assumption that more experience is better "requires greater nuance" (p. 1) because research studies indicate that experience effects are complex and depend on a number of factors.

General Education Research Studies

With the acknowledgement that teacher experience effects are complex and depend on a number of factors, I will now discuss research studies that further enrich our understanding of teacher experience. Instead of looking at how teacher experience affects student achievement, some researchers have taken another approach. These researchers have explored teacher experience by looking at teachers at different points in their professional development to determine if there are differences between teachers at these various levels of teaching experience. The underlying assumption of this research is that teachers move along a continuum of knowledge development from novice to expert (Berliner, 1986, 1988, 1994, 2004, 2008). It should be noted that most of this line of research on teacher experience is relatively immature and has focused primarily on the management of the classroom or on the generic aspects

of teaching (see also Carter, Cushing, Sabers, Stein, & Berliner, 1988; Westerman, 1991).

For example, Sabers, Cushing, and Berliner (1991) focused on generic aspects of teaching to investigate how expert, beginning, and preservice teachers perceive and monitor the simultaneous occurrence of events in the classroom. Saber and his colleagues showed a videotape of a classroom during one class period. The original videotape was edited into three tapes, each showing a different scene of the classroom. These three tapes were played simultaneously, and novice, beginning, and expert teachers were asked to monitor all three scenes. Then the teachers were asked to describe the instructional and management techniques used by the teacher, to think aloud about what they were seeing, to respond to questions about lesson content, student and teacher attitudes, the classroom environment, and to recall specific details about what they had seen afterwards.

The findings of Sabers et al. (1991) indicated that the expert teachers were able to make sense of the complex information they were receiving, and they frequently assigned meaning to the classroom events that they saw and made evaluative judgments about them. In contrast, beginning teachers experienced some sense of being stressed over all the information they were receiving through watching the three scenes that left them “puzzled” about some of the classroom information. Beginning teachers’ comments were often descriptive and contained details that were “reminiscent of radio announcers reporting an athletic event” (Sabers et al., 1991, p. 73). Preservice teachers,

individuals who had no classroom experience, were overwhelmed by the information they were trying to cognitively process and thus became “baffled” by the flood of information. Their comments were the least descriptive and substantive of the three groups of teachers. The findings reported by the authors indicate that there are differences in teacher knowledge based on teacher experience.

Likewise, the Peterson and Comeaux (1987) study adds to our understanding of the differences in the responses of novice teachers and expert teachers. In this study, ten pairs of expert and novice teachers were presented with three classroom scenarios. The researchers asked them to describe the scenarios, to analyze the problems that the teacher faced during teaching, and to suggest alternative ways to teach the lesson. The findings showed that the expert teachers’ analyses of classroom events reflect knowledge of classroom procedures and principles of effective classroom teaching. One expert teacher commented on the teacher returning an essay test by pointing out that the teacher could read the essay aloud if it was a good example, or make some comments on errors made, or clear up some misconceptions. In essence, the expert teachers’ comments reflect an understanding of the pedagogical principle that tests can be used for teaching and learning and not just for evaluation purposes.

In contrast to the expert teachers, novice teachers’ comments were simple. Their explanations indicated that they did not generate the best solution to the situation. Furthermore, novice teachers were able to give little justification

for their comments. Although the contrast of responses of teachers with different levels of experience, adds to the richness of the research base regarding the general effects of teacher experience on teacher knowledge, this research, too, is an example of our generic understanding of expert-novice differences in education.

Although a general understanding of the experience level of the teacher (expert-novice differences) can be helpful, it is not sufficient, given the fact that experience effects are indeed complex and depend on a number of factors as noted by Rice (2010). It is possible that one of these factors noted by Rice is subject-specific knowledge (content and/or pedagogical content knowledge). Therefore, it is not beneficial to this dissertation to give an exhaustive list of other studies that look at expert-novice experience effects in education in a generic way (i.e., Sabers, Cushing, & Berliner, 1991), nor is it beneficial to give an exhaustive list of studies that looked at expert-novice experience differences in other subject areas (i.e., Brownell, Bishop, Gersten, Klinger, Penfield, Dimino, Haager, Menon, & Sindelar, 2009; Grossman, 1990; Leinhardt, 1989; Leinhardt & Smith, 1985; Tsui, 2003). In order to understand the experience effects on teachers of reading, it is necessary to investigate how experience affects the subject-specific content knowledge and pedagogical content knowledge of experts and novice teachers who teach reading. Unfortunately, little research has been done in this area. Next, are three studies that examine reading teachers with different levels of experience teaching.

Three Research Studies that Explore Teacher Experience in Reading

In the first of three studies that have explored teacher experience in reading, Gallant and Schwartz (2010) examined teachers at three distinctively different points in their professional development. The authors used 15 preservice teachers, 15 in-service classroom teachers with 3 - 10 years of teaching experience, and 15 Reading Recovery teachers with 13 - 31 years of teaching experience. All three groups of teachers were shown two video clips showing the same first-grade child reading a familiar text in a Reading Recovery lesson to the same teacher at the beginning and at the middle of the school year. All three groups of teachers (preservice, classroom teachers, & Reading Recovery teachers) were asked to respond to written prompts that invited them to use their current knowledge to interpret, infer, and recommend a tentative instructional course for the child. The authors' findings indicated that preservice teachers' statements were tied to clearly observed behaviors in the video clip and a limited view of the reading process. In contrast, classroom teachers had a more developed system of concepts related to literacy than the preservice teachers had and were able to suggest a broad range of instruction after viewing the video. The Reading Recovery teachers had the most complex and principled understanding of a potential instructional course after their viewing of the video clip. These findings indicate that teachers' understanding of concepts related to literacy become more complex and principled as the teachers' gain more years of experience, which lends support to the idea of a developmental model of teacher

knowledge. This teacher developmental model helps to explain how teachers' pedagogical knowledge increases and changes to reflect more advanced knowledge as a result of classroom teaching experience (Snow et al., 2005).

In the second study, Allen and Swearingen (2002) examined the development of pedagogical content knowledge of preservice (*n* = 18) and inservice teachers (*n* = 11) as they implemented newly learned assessment and instructional strategies with at-risk readers in clinical settings. The preservice teachers worked in pairs to tutor children during the regular semester at a university reading clinic; the inservice teachers worked for 4 days a week for 6 weeks in a special reading academy as part of a 6 hour practicum that was required of these students for a Special Reading Certification. Data for this study included teacher written reflections, lesson plans, and observations by both teachers and researchers.

Four stages of development emerged during data analysis: (1) novice, (2) advance beginner, (3) competent, and (4) proficient. Characteristics of the novice stage were "no risk taking, little instructional planning, or evaluation, self-doubt, inappropriate choice of materials and/or activities". Teachers at this first stage made comments such as "Help!" (p. 53) and "I'm just wondering now what kinds of activities I'm going to have to plan to keep him more focused" (p. 54). The second or novice stage characteristics included taking some risks in conjunction with seeking reassurance from the instructor, offering some suggestions for activities, making lesson plans that include some basic knowledge about teaching literacy concepts and the appropriate associated

assessment. Comments from teachers at this stage included: “I’m not sure, but this is what I will try” and “I think I know what I’m doing, but I still need your support and help” (p. 84). The third or competent stage, included teachers who exhibited some or all of the following characteristics: took more risks and based lesson plans on students’ needs. Teachers at this stage made comments such as, “Jody is beginning to respond to the think alouds and I can tell she comprehends better” and “This is what I decided to do with my students” (p. 55). In the fourth stage, the proficient stage, teachers were seen engaging in the following activities: looking for the deeper causes for student behavior and performance, making insightful observations that informed their instructional decisions. Comments from this group of teachers included the following: “I realize that the girls are more involved and excited when they lead and I just guide” and “If I know what my students can do, I can focus in and use what they know to teach what they don’t know” (p. 55). The findings from this study suggest that teachers’ pedagogical content knowledge develops in ways suggested by Snow et al.’s (2005) model of teacher knowledge development.

In the Allen and Swearingen (2002) study all preservice teachers began at the novice stage but an individual’s time at that level varied across the group. However, none of the preservice teachers advanced beyond the competent level and one inservice teacher began at the advanced beginner stage and made no progress during the term. Of the eleven inservice teachers, seven teachers began at the competent stage, and four at the proficient stage. One of the inservice teachers began at the proficient stage and stayed at that level the entire

time. This knowledge and understanding of how the teachers moved along the continuum to improved decision-making enriches our understanding of the effect of experience on teachers.

In the last study to be discussed, Ross and Gibson (2010) compared and analyzed the characteristics of expert and novice teachers' noticing ability during observation of literacy instruction. Expert participants (n = 7) were defined as university reading faculty with 24 - 42 years of clinical teaching experience. Less experienced participants were K-12 teachers who were students in a university graduate program in reading (n = 22), with 3 - 25 years of classroom teaching experience. Study data came from participants' transcribed audio-recorded observations made while observing three literacy lesson videos. Analysis included coding, identification of emerging themes, and summarization of the noticing content of each transcript. Even though observations varied across participants, there was remarkable consistency with little variations within expert/novice groups for both the quality and quantity of comments. Data analysis indicated that experts in contrast to novices demonstrated consistent detailed hypothesizing of literacy-related content knowledge, breadth and depth of observation elaboration, and the ability to see meaningful patterns in students' responses, as well as pivotal events during literacy instruction. Thus, one could make the argument that the findings regarding teacher noticing indicate that expert noticers have first of all, obtained more knowledge of reading than their less experienced counterparts as a result of their years of experience and

secondly, the differences in experts' noticing is caused by the way their knowledge is structured and/or organized in a more advanced manner.

Conclusion of Experience

Initially, research on teacher experience yielded no apparent patterns. The research findings regarding teacher experience appeared to be ambiguous at best (Hanushek, 1997). Further investigation into these ambiguous findings indicated potential methodological issues that may have contributed to the ambiguous findings. Subsequent analysis of research done after 1997 indicates that there is a positive relationship between teacher experience, student achievement, and emerging predictive patterns regarding experience. Therefore, currently, researchers assert that teacher experience does matter with the caveat that more is not always better (Goe, 2007; Rice, 2003, 2010). At the elementary level, research indicates that experience matters most early in a teacher's career (Rice, 2010), usually during the first four or five years, and this finding is strongest in the subject of mathematics. After this time, the effects of teacher experience appear to "level off," which means that years of experience beyond the fifth year contribute little or no additional benefit in terms of student achievement (Goe, 2007, p. 3). However, there is some evidence that positive effects reemerge among very experienced teachers (more than 14 years). Rice's analysis of the research also indicates that on average, teachers with more than 20 years of experience are more effective than teachers with little experience; however, they are not much more effective than those with 5 years of

experience. Some studies have also documented some evidence that effectiveness *declines* after some point. So once again there is some ambiguity in the findings; in this case regarding the effects of experience after 14 - 20 years of experience. The size of the effect of teacher experience differs depending on the teacher's level of education and the subject area. The impact of the first few years of experience is strongest in the subject of mathematics and more consistent at the elementary and middle school levels than at the high school level (Rice, 2010).

Qualitative studies that examine teachers at different levels of experience (expert-novice studies) note changes in how teachers perceive and interpret classroom activities and student learning. Findings of these studies support Snow et al.'s (2005) developmental model that indicates that as teachers gain more experience: (1) the quantity of their knowledge increases, and (2) the proportion of the teachers' knowledge base changes to reflect a more advanced knowledge. Research findings indicate that the amount of time teachers remain at a given developmental level appears to vary. As a caveat to these findings, however, is that they are based on a limited number of studies.

Conclusion

Using the expertise framework, the current study was grounded on the premise that becoming an expert teacher is a developmental process; that is, teachers' knowledge grows and becomes more complex as they gain teaching experience. Teachers start out as preservice teachers (novices) and through the

accumulation of knowledge about their field, both in what they teach (i.e., content knowledge) and how they teach (i.e., pedagogical content knowledge), they can become experts.

A review of the literature on teacher knowledge indicates that this line of educational research is following in the footsteps of research done on expertise in other fields. Similar to the expertise theoretical framework, which makes the assumption that differences in the performance of novices and experts are caused not only by the differences in the quantity of knowledge held by both but by the differences in the way their knowledge is structured and/or organized, educational developmental models also indicate changes in knowledge in individuals as they move from novice to expert. This can be seen in how Shulman uses the terms content knowledge and pedagogical content knowledge. It can also be seen in the Snow et al. (2005) description of how teacher knowledge increases with experience in both depth and in breadth (Snow et al., 2005). Although the reviewed research studies lend empirical support that teacher knowledge is indeed a complex concept that follows the development of expertise in other domains, further investigation is still warranted.

Another theoretical assumption of the relative approach to expertise is that experts are individuals who have obtained more knowledge over time than novices in their domains, a pattern that is not quite as apparent in the educational research. Current research analyses (Goe, 2007; Rice, 2003, 2010) report findings that indicate elementary “teachers reach their peak performance by increments within the first four or five years” (Goe, 2007, p. 48). However,

research regarding any further increases in expertise over time is inconsistent at this time. In Rice's (2010) most recent analysis of the current research, she reports that the assumption that more experience is better "requires greater nuance" (p. 1) because research studies indicate that experience effects are complex and depend on a number of factors. Whether more classroom experience translates into more expertise for teachers is a question that needs more examination.

Given the review of the literature, the question remains, do teachers develop into professionals in their field the same way other experts develop or do teachers merely need classroom teaching experience to develop into experts? This brings us back to the purpose of this study. The purpose of this study was to examine whether teachers with more experience are in fact greater experts with regards to two types of knowledge than teachers with less experience. The answer to this question is significant, because if the answer is that teachers do not develop expertise solely through classroom experience, then other explanations of teacher expertise must be explored. Moreover, if teachers do not develop expertise solely through classroom experiences, identifying other contributors to their expertise would be critical to an understanding of how to encourage their further development.

This study will address the following two questions regarding 1st – 3rd grade teachers: (a) How does content knowledge and pedagogical content knowledge about reading and reading instruction compare across preservice to advanced experienced teachers?; and (b) What combination of demographic

variables, context variables, and educational background variables are the best predictors of literacy knowledge about reading and reading instruction?

CHAPTER 3

METHODOLOGY

The purpose of this study was to compare preservice and inservice teachers of varying years of experience on the amount of their content knowledge and pedagogical content knowledge of reading and reading instruction. Moreover, I was interested in identifying a collection of variables that contribute to the growth of content knowledge and pedagogical content knowledge. Accordingly, this study addressed the following two questions regarding 1^{st} – 3^{rd} grade teachers: (a) How does content knowledge and pedagogical content knowledge about reading and reading instruction compare across preservice to advanced experienced teachers?; and (b) What combination of demographic variables, context variables, and educational background variables are the best predictors of literacy knowledge about reading and reading instruction?

Participants

Participants in this study were placed into one of six categories: (1) *preservice* teachers were defined as those teachers who had completed their student teaching, but who had not yet entered the teaching field; (2) *newly*

inducted teachers were those teachers who just completed their first or second year of teaching; (3) *early experienced* teachers were those teachers with 3-to-5 years of experience; (4) *intermediate experienced* teachers were those teachers with 6-to-10 years of experience; (5) *experienced* teachers were those teachers with 11-to-20 years of experience; and (6) *advanced experienced* were those teachers with 21 or more years of experience. Demographic information on each category is provided in Tables 1-6.

Instruments

Two surveys were used to obtain data for this study. The first survey, the *Teacher Demographic Information Survey* (TDIS), was an instrument used to collect background data on each participant. The second survey, the *Literacy Instruction Knowledge Survey-Written Subscale* (LIKS-WS) was used to measure each participant's content knowledge and pedagogical content knowledge of reading and reading instruction.

Teacher Demographic Information Survey (TDIS)

Two versions of the Teacher Demographic Information Survey (TDIS) were developed, one for preservice teachers and another one for teachers in the other five categories. The version of the Teacher Demographic Information Survey that was administered to preservice teachers consisted of 13 multiple-choice questions. These multiple-choice items were modeled after those that were used in research conducted by Kerry Herman (2010). The survey

contained questions that were specific to the experiences of pre-service teachers just finishing their baccalaureate degrees at a university. There also were questions regarding participants' age, gender, and ethnicity. Other questions looked at students' educational experiences with regards to literacy courses taken, experience working with children, and self-assessment of literacy knowledge as they prepared to complete their degrees. For example, one question was, "How many reading methods courses have you taken?" This survey instrument is included in the Appendix.

A second version of the Teacher Demographic Information Survey was administered to newly inducted, early experienced, intermediate experienced, experienced, and advanced experienced teachers. This Teacher Demographic Information Survey, developed by Herman (2010), was an expanded version of the previous survey and had 25 multiple-choice questions that were specific to experiences of practicing teachers. Like the survey given to preservice teachers, there were questions regarding participants' age, gender, and ethnicity. The survey was designed to determine the participants' years of teaching and grade levels taught, educational background, kinds of professional development they had, level of certification, and how they obtained their teaching credential. One question asked, "How many years have you taught (including this year)?" Another question asked, "How many undergraduate courses have you completed in reading?"

Literacy Instruction Knowledge Scales-Written Survey (LIKS-WS)

To determine teachers' knowledge of literacy, all participants were administered the newly designed Literacy Instruction Knowledge Scales-Written Survey (LIKS-WS). The LIKS-WS survey is comprised of multiple-choice items and was developed to measure 1st - 3rd grade teachers' knowledge of reading and writing instruction.

The development of the LIKS-WS began as part of the *Primary Grade Reading and Writing Teacher Knowledge Project*, a 4-year project funded by a Teacher Quality Grant (#R305M05003) from the Institute of Educational Sciences (IES) of the U.S. Department of Education. A description of the larger project can be found in the final report document for the Institute of Educational Sciences titled *Connecting Primary Grade Teacher Knowledge to Primary Grade Student Achievement: Developing an Evidence-Based Assessment Tool-The Literacy Instruction Knowledge Scales (LIKS;* Reutzel, Dole, Fawson, Jones, Read, Fargo, & Sudweeks, 2009). As part of the last phase of that project, the research teams used the LIKS-WS to assess teachers' content knowledge and pedagogical content knowledge of reading and writing and to determine if the results of the assessments could be used to predict 1st - 3rd grade students' reading and writing achievement as measured by standardized tests. Basically, the goal of this project was to examine the relationship between teachers' knowledge of and student achievement in reading and writing. For the purpose of this dissertation, however, the LIKS-WS was used to investigate the relation

between 1st – 3rd grade teachers' knowledge of reading and reading instruction and teacher experience.

Although the LIKS-WS was originally developed for beginning to veteran teachers, the LIKS-WS also has value for preservice teachers. Just as it is important to assess inservice, primary grade teachers' content and pedagogical content knowledge concerning effective, evidence-based reading and reading instruction, it is also important to assess the same knowledge in preservice teachers who are about to graduate and join their inservice colleagues. The scores derived from the LIKS-WS may be used to determine gaps in preservice primary grade teachers' content and pedagogical content knowledge, and to inform future professional development needs of these soon to be newly inducted teachers. Further, the performance of preservice teachers can help determine whether experienced teachers' knowledge is advanced by years of teaching experience.

The process of developing the LIKS-WS was a response to the need in the reading research literature for a reliable and valid way to measure teachers' knowledge of reading and reading instruction (Reutzel et al., 2007). Recent research had indicated the importance of such fine-grained assessments of knowledge, as well as the limited research on teacher knowledge of reading and reading instruction. Therefore, additional research in this area was deemed appropriate (National Reading Panel, 2000; Snow, Burns, & Griffin, 1998). Consequently, the Primary Grade Reading and Writing Teacher Knowledge Project researchers began to develop a survey instrument that would capture 1st

- 3rd grade teachers' knowledge of reading and writing (Reutzel & Dole, 2005, 2008). Performance on this instrument could be used as a measure of teacher expertise in the domain of reading and writing instruction.

The framework that was chosen by the Primary Grade Reading and Writing Teacher Knowledge Project researchers (hereafter referred to as the LIKS-WS team) for the development of the LIKS-WS was Shulman's (1986b, 1987) conceptualization of teacher knowledge. The LIKS-WS team chose to develop an instrument that would assess two types of knowledge as defined by Shulman's (1986b, 1987) work: (1) content knowledge (CK), and (2) pedagogical content knowledge (Reutzel, 2010; Reutzel & Sudweeks, 2008).

Although Shulman's conceptualization of teacher knowledge serves as the theoretical framework for the types of knowledge used by the LIKS-WS, three other lines of research form the conceptual basis of teachers' knowledge of 1st - 3rd grade reading and writing. Research on exemplary reading and writing in the primary grades made up the first line of research (Baumann, Hoffman, Duffy-Hester, & Ro, 2000; Hoffman & Pearson, 2000; Pressley, Allington, Wharton-McDonald, Collins-Block, & Morrow, 2001; Presley, Wharton-McDonald, et al., 2001; Taylor, Peterson, Clark, & Walpole, 2000). The second line of research was the measurement of reading-related content and pedagogical content knowledge (Asselin, 1997; Bos et al., 2001; Cunningham et al., 2004; McCutchen, Harry, et al., 2002; Moats & Foorman, 2003; Phelps & Schilling, 2004). The third and final line of research was evidence-based practices in reading and writing (Flower, 1994; Flower & Hayes, 1980; McCardle & Chhabra,

2004; National Reading Panel, 2000; Snow et al., 1998). A very extensive review of the literature using these three lines of research was conducted by the LIKS-WS team.

At the end of this extensive literature review, the LIKS-WS team developed the Taxonomy of Grade 1-3 Teacher Knowledge of Reading and Writing Instruction. This taxonomy was comprised of 40 categories, 20 in the area of reading, and 20 in the area of writing, that were identified as the main domains of teacher knowledge. Examples of these domains included fluency, decoding, phonological/phonemic awareness, vocabulary, and comprehension. A more in-depth discussion regarding the taxonomy and a complete reference list that was used in the formation of the taxonomy can be found at the following website: www.cehs.usu.edu/ecc/web/ies.html.

During the revision process, the LIKS-WS team decided that not all domains were of equal relevance and decided to compact the 40 domains into four “super” domains. The four super domains included (1) decoding, (2) comprehension, (3) writing, and (4) classroom management. Other significant domains such as vocabulary and fluency were not eliminated, but rather were embedded into the four super domains. Issues related to informal classroom assessment, with the exception of classroom management, were incorporated within the context of each of the remaining three domains.

For each of the four domains, the LIKS-WS team generated multiple-choice items. Multiple-choice items were the chosen format for the questions because of ease of answering and assessing and because prior research had

indicated that the multiple-choice format was as effective as other item formats in the assessment of pedagogical content knowledge (Phelps, 2009; Phelps & Schilling, 2004). Over 200 items were initially generated by the research team. All items underwent multiple revisions by LIKS-WS team members. Team members carefully scrutinized items in terms of quality and function of distracters, type of teacher knowledge, and distribution of items. Of the 200 items, 150 were chosen from three domains for the first pilot of the LIKS-WS. These three domains were (1) decoding (45 - 60 items), (2) comprehension (45 - 60 items), and (3) writing (30 - 40 items).

Nine school districts in Utah granted permission to pilot the instrument in their districts. After the initial pilot, an additional three pilot tests were administered. Revisions of the LIKS-WS were made to increase the reliability of test scores before the fourth and final administration. The resultant survey instrument is the one that was used in this dissertation.

This survey contained 103 multiple-choice items that encompassed three domains (subscales): decoding, comprehension, and writing. Because the focus of this dissertation was teachers' knowledge of reading and reading instruction, only two subscales were retained: decoding and comprehension. Therefore, the LIKS-WS used in this dissertation consisted of 78 multiple-choice items that surveyed teachers' content and pedagogical content knowledge of decoding and comprehension. Thirty-four items addressed decoding, which included phonemic awareness, phonics, as well as fluency. Forty-four items addressed

comprehension, which included vocabulary. Sample items from the LIKS-WS can be found in Tables 7 and 8.

All 78 multiple-choice items on the LIKS-WS were coded by eight literacy experts as addressing either content knowledge or pedagogical content knowledge. Four of the eight literacy experts were members of the LIKS-WS research team. The other four literacy experts were doctoral candidates in the following departments in the College of Education at the University of Utah: (1) Teaching and Learning, (2) Special Education, (3) Educational Psychology, and (4) Educational Leadership. These four literacy experts were involved in literacy research in either elementary, middle school, or adult learners. Each literacy expert was only identifiable by an assigned number and no personal information was connected to this number, thus ensuring confidentiality. There was no time limit for the experts to complete their coding of the survey; however, most participants took approximately 60 minutes to completely code the survey items. Responses to all 78 items were tallied. Results of the expert coding indicated that a total of 20 items on the LIKS-WS measured teachers' content knowledge and 58 of the items surveyed teachers' pedagogical content knowledge.

A more in-depth and comprehensive discussion regarding the development and validation of the LIKS-WS survey instrument can be found at the following website: www.cehs.usu.edu/ecc/web/ies.html..

Procedures

The procedures will be explained in two parts. First, preservice teachers completed the surveys during the spring semester just after they had completed their student teaching. The surveys were administered by the researcher. Newly inducted, early experienced, intermediate experienced, experienced, and advanced experienced teachers went through a different procedure the previous year. Their surveys were administered by district research coordinators in their districts.

PreserviceTeachers

Preservice teachers at one university in Utah were administered the two instruments during two student teaching seminar classes in the spring semester. These seminar classes were held at the completion of the preservice teachers' student teaching. The researcher administered the TDIS and the LIKS-WS. All students' questions were answered by the researcher before passing out the consent form, the TDIS, the LIKS-WS, the bubble sheet, and a number 2 pencil to each participant. All participants were asked to mark their responses to the instruments by marking the appropriate spots on the bubble sheet. Other than administration directions, which were scripted, no assistance was provided to the survey participants during the administration of the survey. Each participant was only identifiable by an assigned number and no personal information was connected to this number, thus ensuring confidentiality. There was no time limit

for survey participants to complete the survey; however most participants took approximately 60 - 90 minutes to complete the survey.

At the second university in Utah the same procedure was repeated except that all students were in one large room during the university's scheduled end of semester class when the researcher administered the survey.

Newly Inducted, Early Experienced, Intermediate Experienced, Experienced, and Advanced Experienced Teachers

The TDIS and the LIKS-WS data for the newly inducted, early experienced, intermediate experienced, experienced, and advanced experienced teachers were obtained from the larger LIKS study. Data from this study were obtained from nine school districts. A formal request letter along with a packet of research application information was mailed to each of the nine school districts in Utah. Each district that agreed to participate selected a research coordinator to administer the LIKS-WS. The research team created training procedures and materials for the research coordinators. Then, the district level research coordinators were trained together during a 3-hour long training session by three members of the LIKS research team at one of the school district offices. During the training, district research coordinators were provided with the following materials: (1) a contract for services to be read and signed by each district research coordinator; (2) a role description and list of services to be completed for each school district research coordinator to receive compensation; (3) a listing of randomly selected elementary schools; (4) a recruitment script for talking with

elementary school principals; (5) sufficient number of LIKS-WS instruments; (6) sufficient computer bubble sheets; (7) sufficient #2 pencils; (8) sufficient prepaid Fed-Ex boxes; (9) a principal's copy of an informed consent letter for participation of the school in the project; (10) a recruitment script for recruiting elementary school teachers to complete the LIKS-WS; (11) a payment/stipend form for each teacher who completed the LIKS-WS pilot version; and (12) an IRB approval letter of consent for each teacher to read and sign prior to completing the LIKS-WS pilot.

Once all necessary consent forms were filled out, school district research coordinators administered both the LIKS-WS and the TDIS survey to various groups of 1st-3rd grade teachers within their respective school districts who chose to participate in the research. A time frame for survey administration was given to each of the district coordinators. Other than administration directions, which were scripted, no assistance was provided to the survey participants during the administration of the survey. Each participant was only identifiable by an assigned number and no personal information was connected to this number, thus ensuring confidentiality. There was no time limit for survey participants to complete the survey; however most participants took approximately 60-90 minutes to complete the survey. During the survey administration, participants filled out a payment/stipend form as a condition of receiving a stipend for completing the survey. District coordinators put all completed LIKS-WS and TDIS forms and their associated bubble sheets in a prepaid FedEx box and mailed them back to one of the two principle investigators on the project. All

newly inducted, early experienced, intermediate experienced, experienced, and advanced experienced teachers completed the LIKS-WS seven to eight months into the school year (February or March) (D. R. Reutzel, personal communication, September 26, 2011).

Statistical Analyses

Variables

Demographic variables. The TDIS provided background information on preservice, newly inducted, early experienced, intermediate experienced, experienced, and advanced experienced teachers. Preservice teachers responded to 13 multiple-choice items, the inservice teachers responded to 25 multiple-choice items. Information from the inservice teachers was collected by Herman (2010). This information consisted of 21 variables shown in Table 9.

The demographic data for the present study consisted of a subset of 13 of these variables. This subset was collected because several of the demographic questions did not apply to the preservice teachers. For example, three variables, knowledge of decoding, knowledge of comprehension, preparedness for struggling readers, were not applicable to the present study. The variables: highest degree earned, year degree obtained, how certification was obtained, number of undergraduate reading courses, Level 2 endorsement, number of years in a Reading First School, gender, ethnicity, member of IRA, *Research Quarterly,* and *The Reading Teacher* were dropped due to a lack of variability in the sample. Data for seven remaining variables were retained for the analyses

for the present study: number of graduate courses, Level 1 endorsement, grade currently teaching, Reading First School, Title 1 School, years of teaching experience, and age. However, age was later dropped because of the high correlation it had with years of experience (Pearson r = .75). The six demographic variables from the original list of TDIS variables were categorized using the following three categories: (1) demographic variables, (2) context variables, and (3) educational background variables. The categorization of the variables is shown in Table 10.

Content knowledge and pedagogical content knowledge. Before analyzing the participants' scores on the two latent variables produced by the LIKS-WS (i.e., content knowledge and pedagogical content knowledge), I conducted a confirmatory factor analyses using structural equation modeling. Construct validity is established by examining constructs (i.e., latent variables) that are not measured directly (Cronbach & Meehl, 1955). Confirmatory factor analysis allows the researcher to test specific hypotheses about how the measure of a construct is related to other measures based on theory or empirical evidence, or to examine constructs and their relations with other constructs. Confirmatory factor analyses can lend statistical support to the empirical evidence that has been mustered in support of the two factors. AMOS 18 was used for the confirmatory factor analysis. This analysis used 105 preservice teachers and 388 inservice teachers.

The first step in conducting the confirmatory factor analysis was to identify variables that did not discriminate well between high and low knowledge

participants. Using SPSS FREQUENCIES three groups were formed based on overall LIKS-WS scores: upper, medium, and low. Each item on the LIKS-WS was analyzed to determine how many participants in each of the three groups (upper, middle, and low) got the item correct and what associated percentage of correct responses was attributed to each of the three groups. Using the item analysis, a discrimination index was created for each item (Kubiszyn & Borich, 1987). The difference in the percentage of the upper and the lower group was calculated for each item. Items that had less than a 20% difference were dropped. This included 21 items: 1, 4, 9, 14, 18, 22, 25, 28, 32, 33, 34, 36, 40, 57, 59, 60, 64, 68, 70, 74, 76, and 77. These items were removed from all subsequent analyses because of their poor discrimination.

Univariate and multivariate normality was checked on the remaining data using the AMOS 18 program. Twenty-eight of the variables were strongly negatively skewed (critical ratios beyond 1.96), and 13 were strongly positively skewed. In addition, nearly all the variables showed strong negative kurtosis (critical ratios beyond 2.58). Mardia's coefficient of multivariate kurtosis was -27.62 with a critical ratio of -3.76. Therefore, the data violated the assumption of normality. In addition, Mahalanobis d-squared values for 5 participants were abnormally high, and these 5 participants were dropped from further analyses.

Following guidelines for non-normal data developed by Byrne (2001), I used a bootstrapping procedure with 500 random samples with replacement. The model specified consisted of the two latent variables, content knowledge and pedagogical content knowledge, with LIKS-WS items 3, 5, 7, 8, 11, 13, 15, 16,

17, 19, 20, 24, 26, 27, 30, 31, 35, 38, 39, 41, 44, 45, 46, 47, 48, 49, 50, 52, 54, 55, 63, 65, 66, 67, 69, 71, 72, 73, 75, and 78 linked to pedagogical content knowledge, and LIKS-WS items 2, 6, 10, 12, 21, 23, 29, 37, 42, 43, 51, 53, 56, 58, 61, and 62 linked to content knowledge. There were 56 observed variables yielding 1596 data points, and with 113 unknown parameters this resulted in 1483 DF. Therefore, the model was over-identified.

The model was recursive with a sample size of 475. Chi Squared was 1862.58, $p < .001$. Usable bootstrap samples equaled 500. The goodness-of-fit statistics are presented in Table 11. Standardized regression weight estimates ranged from .173 to .467, covariance estimate between PCK and CK was .024, variance estimates ranged from .022 to .241, and square multiple correlations ranged from .030 to .218. All estimates were significant $p < .05$.

The Root Mean Square Residual (RMR) of .010 and the Root Mean Square Error Approximation of .023, with a 90% confidence interval indicated a well-fitting model; however, the Goodness of Fit Index (GFI) and Comparative Fit Index (CFI) were far below .95, the recommended level for a good model fit. Therefore, the data do not fit the proposed model well. The LIKS-WS items do not clearly identify a content knowledge nor a pedagogical content knowledge construct.

The modification indexes and parameter change statistics were examined in post hoc analyses to identify covariances and regression weights that were large. There were large modification indexes identified for the regression weights concerning 22 observed variables. This resulted in the elimination of 13 LIKS-

WS items from the pedagogical content knowledge construct and 9 items from the content knowledge construct. The remaining items for pedagogical content knowledge were: 3, 5, 13, 15, 16, 17, 19, 20, 26, 30, 31, 38, 41, 44, 46, 47, 49, 50, 52, 63, 65, 66, 67, 69, 72, 73, and 78. The remaining items for content knowledge were: 2, 6, 21, 23, 51, 56, and 58.

Using structural equation modeling in a confirmatory factor analysis, once again using the bootstrapping procedure with 500 random samples with replacement, the resulting model was recursive with a sample size of 475, Chi Squared was 571.208, $p = .084$. Usable bootstrap samples equaled 500. The goodness-of-fit statistics are presented in Table 12.

All goodness-of-fit indices represent a moderate to good fit for the modified model. The Chi Squared statistic was not significant, indicating that there was no significant difference between the estimated population covariance and the model covariance. In addition, a test of the Chi Squared values between the two models indicated a significant improvement: Original Model Chi Squared = 1862.585, Modified Model Chi Squared = 571.208; 1862.585 – 571.208 = 1291.377 (1 df), $p < .001$.

In conclusion, the confirmatory factor analysis indicated that there is little support for maintaining the two distinct constructs of pedagogical content knowledge and content knowledge. Therefore, in all remaining analyses, a single literacy knowledge construct will be used consisting of the composite of participants' scores on the two constructs. Testing of the modified model will

need to wait until new samples of preservice and inservice teachers are collected.

Statistical Tests

The purpose of this study was to compare preservice and inservice teachers of varying years of experience on the amount of their content knowledge and pedagogical content knowledge of reading and reading instruction. Moreover, I was interested in identifying a collection of variables that contribute to the growth of content knowledge and pedagogical content knowledge. To address the first research question, a one-way ANOVA was performed using the composite score for literacy knowledge as the dependent variable and years of teaching experience as the independent variable. The second research question was answered using a statistical multiple regression with the composite score for knowledge as the dependent variable and a combination of demographic variables, context variables, and educational variables as the independent variables. The alpha level for all tests was set at .05.

Table 1

Preservice Teachers' Demographic Information:

Gender, Age, and Ethnicity

Variable	Frequency	Percentage
Gender		
Female	93	88.6
Male	8	7.6
Missing	4	3.8
Total	105	100
Age		
20-29	88	83.8
30-39	9	8.6
40-49	4	3.8
50-59	1	1.0
Missing	3	2.9
Total	105	100
Ethnicity		
Asian	4	3.8
Caucasian/White	96	91.4
Hispanic/Latino	2	1.9
Missing	3	2.9
Total	105	100

Table 2

Newly Inducted Teachers' Demographic Information:

Gender, Age, and Ethnicity

Variable	Frequency	Percentage
Gender		
Female	72	93.5
Male	4	5.2
Missing	1	1.3
Total	77	100
Age		
20-29	50	64.9
30-39	16	20.8
40-49	8	10.4
50-59	3	3.9
Total	77	100
Ethnicity		
African American	1	1.3
Caucasian/White	70	90.9
Hispanic/Latino	2	2.6
Other	4	5.2
Total	77	100

Table 3

Early Experienced Teachers' Demographic Information:

Gender, Age, and Ethnicity

Variable	Frequency	Percentage
<u>Gender</u>		
Female	56	96.6
Male	2	3.4
Total	58	100
<u>Age</u>		
20-29	32	55.2
30-39	14	24.1
40-49	5	8.6
50-59	5	8.6
60+	2	3.4
Total	58	100
<u>Ethnicity</u>		
American Indian	2	3.4
Caucasian/White	54	93.1
Hispanic/Latino	2	3.4
Total	58	100

Table 4

Intermediate Experienced Teachers' Demographic Information:

Gender, Age, and Ethnicity

Variable	Frequency	Percentage
Gender		
Female	69	98.6
Male	1	1.4
Total	70	100
Age		
20-29	11	15.7
30-39	32	45.7
40-49	16	22.9
50-59	10	14.3
60+	1	1.4
Total	70	100
Ethnicity		
American Indian	1	1.4
Asian	2	2.9
Caucasian/White	65	92.9
Hispanic/Latino	1	1.4
Missing	1	1.4
Total	70	100

Table 5

Experienced Teachers' Demographic Information:

Gender, Age, and Ethnicity

Variable	Frequency	Percentage
<u>Gender</u>		
Female	83	93.3
Male	6	6.7
Total	89	100
<u>Age</u>		
30-39	25	28.1
40-49	28	31.5
50-59	32	36.0
60+	4	4.5
Total	89	100
<u>Ethnicity</u>		
Caucasian/White	86	96.6
Hispanic/Latino	3	3.4
Total	89	100

Table 6

Advanced Experienced Teachers' Demographic Information:

Gender, Age, and Ethnicity

Variable	Frequency	Percentage
Gender		
Female	67	89.3
Male	8	10.7
Total	75	100
Age		
40-49	15	20.0
50-59	51	68.0
60+	9	12.0
Total	75	100
Ethnicity		
Asian	2	2.7
Caucasian/White	70	93.3
Hispanic/Latino	2	2.7
Other	1	1.3
Total	75	100

Table 7

Literacy Instruction Knowledge Scales-Written Scales

(LIKS-WS) Sample Items: Decoding

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2. Which set of words is decodable?
   A. *bed, the, sit*
   B. *side, some, roam*
   C. *wash, boil, gave*
   D. *chap, slew, soft*

16. Mr. Nakamichi has too many of his second grade students coming to him during their own reading and asking him to pronounce words that they should already be able to decode. What should Mr. Nakamichi do?
   A. have students practice troublesome words on a word wall
   B. tell students to use the context clues to figure out the words they cannot decode
   C. have students keep a list of words they cannot decode on their own during reading
   D. remind students to apply their decoding skills during reading

17. Two or three times each week Mrs. Hruby teaches "phonics through spelling" with her first-grade students. She pronounces words sound-by-sound as her students listen, write the appropriate letters, and then blend the letters to identify the words. This activity is likely to be effective because it:
   A. reinforces students' recognition of common spelling patterns.
   B. requires students to use letter-sound relationships to blend unfamiliar words.
   C. reviews and strengthens students' ability to recognize and blend word chunks.
   D. prepares students to combine letter-sound relationships with meaning based clues.

20. Mrs. Arnold wants to increase her first-grade students' oral reading fluency. Based on current research, which would be the **best** way for her to increase their fluency?
   A. engage students in repeated readings
   B. help students practice basic sight words
   C. lead students in choral readings

Table 7 Continued

29. Which is a distinguishing characteristic of phonemic awareness instruction?
    A. uses printed letters
    B. uses two cueing systems
    C. does not use printed letters
    D. links meaning to sound

Answers: **Decoding** 2(D), 8(B), 17(B), 20(A), 29(C)

Table 8

Literacy Instruction Knowledge Scales-Written Scales

(LIKS-WS) Sample Items: Comprehension

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38. When selecting text for comprehension instruction which of the following would be the **least** appropriate?
    A. decodable text
    B. text from a basal
    C. picture book
    D. chapter book

39. Which words would be considered to be vocabulary words for a second-grade reading lesson for narrative text?
    A. *house, friend, dog*
    B. *signaled, overhear, gigantic*
    C. *mixed, hopped, stopped*
    D. *float, goat, moat*

40. What is the difference between sight words and vocabulary words?
    A. sight words are learned through decoding and vocabulary words are not
    B. sight words are learned on sight and vocabulary words are learned by decoding
    C. sight words are related to recognition and vocabulary words are related to meaning

54. To maximize comprehension after reading a story, the discussion should focus on:
    A. sequencing the events of the story.
    B. the most important parts of the story.
    C. the details of the story.
    D. the characters in the story.

57. Which of the following are comprehension strategies?
    A. question generating, skimming, summarizing
    B. predicting, activating background knowledge, sequencing
    C. question generating, visualizing, predicting
    D. following directions, finding the main idea, cause and effect

---

Answers: **Comprehension** 38(A), 39(B), 40(C), 54(B), 57(C)

Table 9

Original TDIS Variables

Educational Variables
Highest Degree Earned
Year Degree Earned
Number of undergraduate reading courses
Number of graduate reading courses
Level 1 endorsement
Level 2 endorsement
How certification was obtained
Demographic Variables (School Related)
Grade currently teaching
Reading First School
Number of years in a Reading First School
Title 1 School
Demographic Variables (Teacher Related)
Ethnicity
Age
Gender
Years of teaching experience
Motivational Variables
Member of International Reading Association (IRA)
Subscribes to *Reading Teacher*
Subscribes to *Reading Research Quarterly*
Self-Perception Variables
Preparedness for struggling readers
Knowledge of decoding
Knowledge of comprehension

Table 10

TDIS Variables: Educational Background, Context, and Demographic Variables

Educational Background Variables
Number of graduate courses
Level 1 endorsement
Context Variables
Grade currently teaching
Reading First School
Title 1 School
Demographic Variables
Years of teaching experience

Table 11

Goodness-of-Fit Statistics for Proposed Model

RMR	GFI	AGFI	CFI	RMSEA	Lo	Hi
.010	.879	.869	.788	.023	.020	.027

Table 12

Goodness-of-Fit Statistics for Modified Model

RMR	GFI	AGFI	CFI	RMSEA	Lo	Hi
.010	.935	.926	.925	.013	.000	.021

CHAPTER 4

RESULTS

The purpose of this study was to examine whether teachers with more teaching experience possess greater expertise with regards to pedagogical content knowledge and content knowledge than teachers with less experience, and to identify a collection of variables that contribute to the growth of pedagogical content knowledge and content knowledge. Analyses showed that the two constructs are not well-defined, and therefore, a composite of the two was used in all analyses. This chapter is divided into two sections. The first section describes the analysis of the first research question, and the second describes the analysis of the second research question.

Research Question 1

How does literacy knowledge about reading and reading instruction compare across preservice teachers to advanced experienced teachers?

A one-way ANOVA with years of experience as the independent variable and literacy knowledge the dependent variable was conducted using both preservice and inservice teachers. The analysis revealed differences among teachers with different years of experience, $F(5, 472) = 14.43$, $p < .001$, partial

eta squared = .13. Tukey's HSD post hoc showed that the only significant difference was between preservice teachers and all groups of inservice teachers (see Table 13). Therefore, from the first 1 - 2 years of teaching and beyond, there was no increase in teacher literacy knowledge.

Research Question 2

What combination of demographic variables, context variables, and educational background variables are the best predictors of literacy knowledge about reading and reading instruction?

A backward deletion statistical regression (Tabachnick & Fidell, 2007) was performed using participants' composite scores on the LIKS-WS as the dependent variable and number of graduate courses, Level 1 endorsement, grade currently teaching, Reading First school, Title I school, and years teaching experience as independent variables. Level 1 endorsement, Title I school, and Reading First School were dichotomous variables; however, grade teaching, years teaching, and number of graduate courses had to be recoded into vectors. Grade taught (i.e., first, second, and third) were dummy coded into two vectors (gradevec1, gradevec2), years teaching was effect coded into two vectors, one a linear relation and the other a quadratic relation (yrseffectcode1, yrseffectcode2, respectively), and number of graduate level reading courses was dummy coded into three vectors (gradcoursevec1, gradcoursevec2, gradecoursevec3). For this analysis, only the groups of inservice teachers were included.

The assumptions of normality, homoscedasticity, and linearity were tested within the regression analysis by examining the residuals. A visual inspection of the residual scatterplot (see Figure 1) shows the residuals to be normally and linearly distributed, with no observable incidence of heteroscedasticity. In other words, evaluation of assumptions indicated that all three assumptions: normality, homoscedasticity, and linearity were met, and no transformations of variables were indicated by the scatterplot.

Two additional assumptions also recommended by Tabachnick and Fidell (2007) were tested. The first assumption, ratio of cases to independent variables (IVs), was met according to the criteria noted by the authors. For testing multiple regression, Tabachnick and Fidell's recommendation is $N \geq 50 + 8m$ (m = number of IVs). Because the maximum number of independent variables in any of the models tested did not exceed 6, and the sample for the study was 323, this assumption was not violated. The second assumption is related to the issue of the presence of strong relationships among independent variables, also known as multicollinearity. The largest correlation was between Reading First school and Title I school, .55, $p < .01$.

Before the presentation of the results of the multiple regression analysis that follows, it should be noted the criteria developed by Ferguson (2009) to assess the combined contributions of the sets of explanatory variables in each of the models was used in this study. According to Ferguson's guidelines, multiple regression models with R^2 values of 4% suggest a small effect size; 25% suggest

a medium effect size; models with values of 64% or greater suggest a large effect size.

The backward deletion statistical regression removed Reading First School, level 1 endorsement, yearseffectcode2, gradcoursevec2, gradcoursevec3, and Title I school, in that order. With the removal of these independent variables, the R was reduced from .83 to .82, and none of the removed variables significantly impacted the change in R^2. The final regression model retained yrseffectcode1 (the linear relation of years of teaching), gradevec1, gradevec2 (grade taught), and gradcoursevec2 (the vector comparing the difference between teachers who had taken 0-2 graduate courses and those who had taken 10 or more. Table 14 displays the unstandardized regression coefficients (B), the intercept, the standardized regression coefficients (β), the R^2 Changed, and R, R^2, and adjusted R^2. The four variables accounted for 68% of the variability in the composite measure of literacy knowledge. By far the largest contributor to the composite measure of literacy knowledge was grade taught (i.e., the two vectors accounted for 66% of the variability). The linear relation of years of experience and the number of graduate courses significantly contributed but only accounted for about 2% of the variability.

To clarify the relation between grade taught and teachers' knowledge of reading and reading instruction, an ANOVA was conducted using grade taught (first, second, third) as the independent variable and literacy knowledge as the dependent variable. Results showed a significant main effect with a very large effect size, F (2, 358) = 376.40, $p < .001$; partial eta squared = .68. A post hoc

analysis using Tukey's HSD indicated that there were significant differences between all pairs of grades: grade 1 (n = 142, M = 25.32, SD = 4.94), grade 2 (n = 106, M = 32.86, SD = 3.90), and grade 3 (n = 113, M = 41.10, SD = 4.64). To clarify the relation between graduate reading courses taken and teachers' knowledge of reading and reading instruction, an analysis was conducted on the significant vector (i.e., the vector comparing the difference between teachers who had taken 0 - 2 graduate courses and those who had taken 10 or more. An ANOVA was conducted comparing the two groups. Results showed a significant effect with a large effect size, F (1, 218) = 73.51, p < .001; partial eta squared = .25. Teachers who had attended 0 - 2 graduate courses (n = 170, M = 27.33, SD = 7.04) performed worse than teachers who had attended 10+ graduate courses (n = 50, M = 37.40, SD = 8.14).

Finally, to clarify the significant linear relation between years teaching and literacy knowledge (i.e., the yrseffectcode1 vector), Figure 2 shows a slight but significant linear trend from 1 - 2 years to 21+ years, with 6 - 10 and 11 - 20 years likely exerting the greatest influence on this relation.

Table 13

Mean and Standard Deviation for the Six Levels of Years of Teaching Experience

Teaching Experience	n	M	SD
0 years	105	25.41	6.22
1 - 2 years	77	31.87	7.24
3 - 5 years	58	31.02	7.94
6 - 10 years	70	33.90	8.35
11 - 20 years	89	32.73	8.09
21+	75	31.78	8.38

Table 14

Statistical Regression of Educational Background Variables, Context Variables, and Demographic Variables on Teacher Knowledge of Reading and Reading Instruction

Variables	*B*	SE B	β	R^2 Change
1. Yrseffectcode1	-.62	.18	-.11	.01
2. Gradevec1	-14.70	.60	.-91	.54
3. Gradevec2	-6.45	.62	-.38	.12
4. Gradcoursevec1	2.08	.73	.10	.01
				R^2 = .68
				Adjusted R^2 = .68
				R = .83

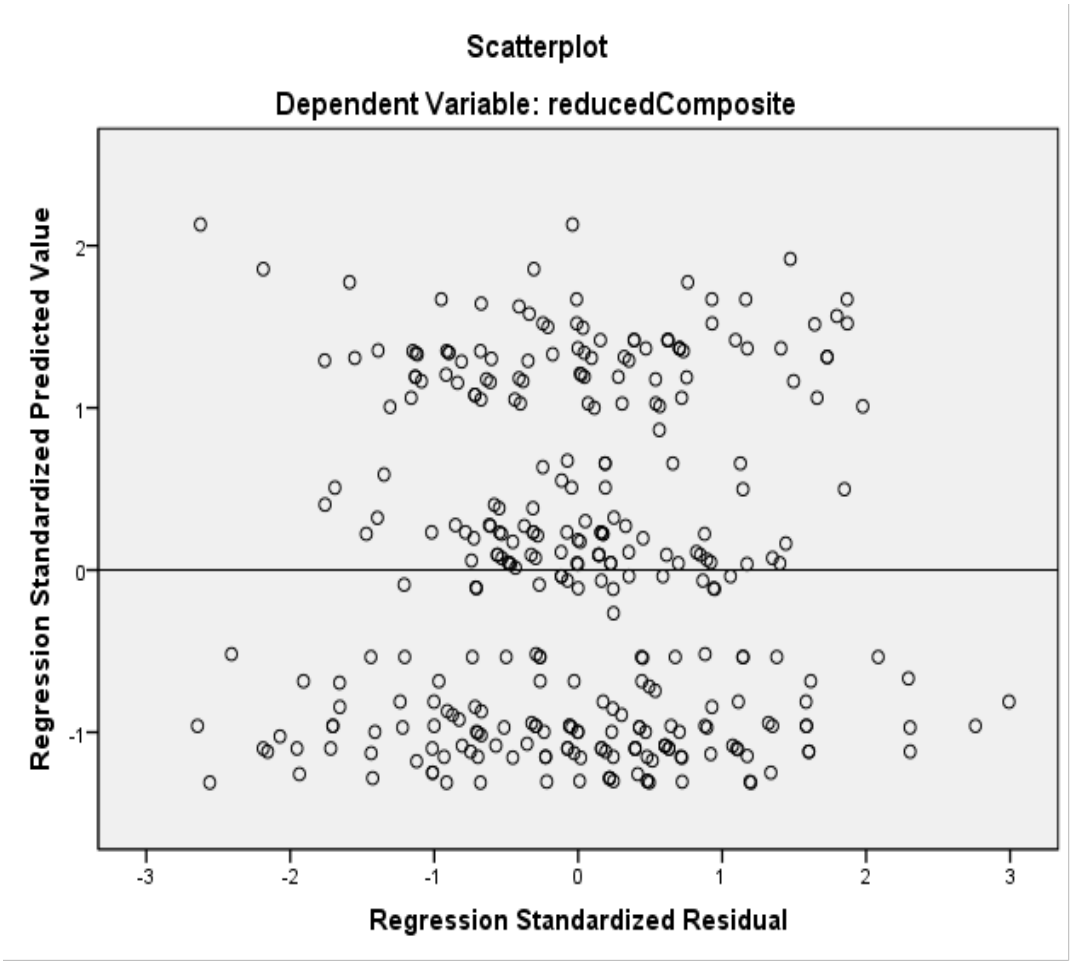

Figure 1. Scatter plot of residuals.

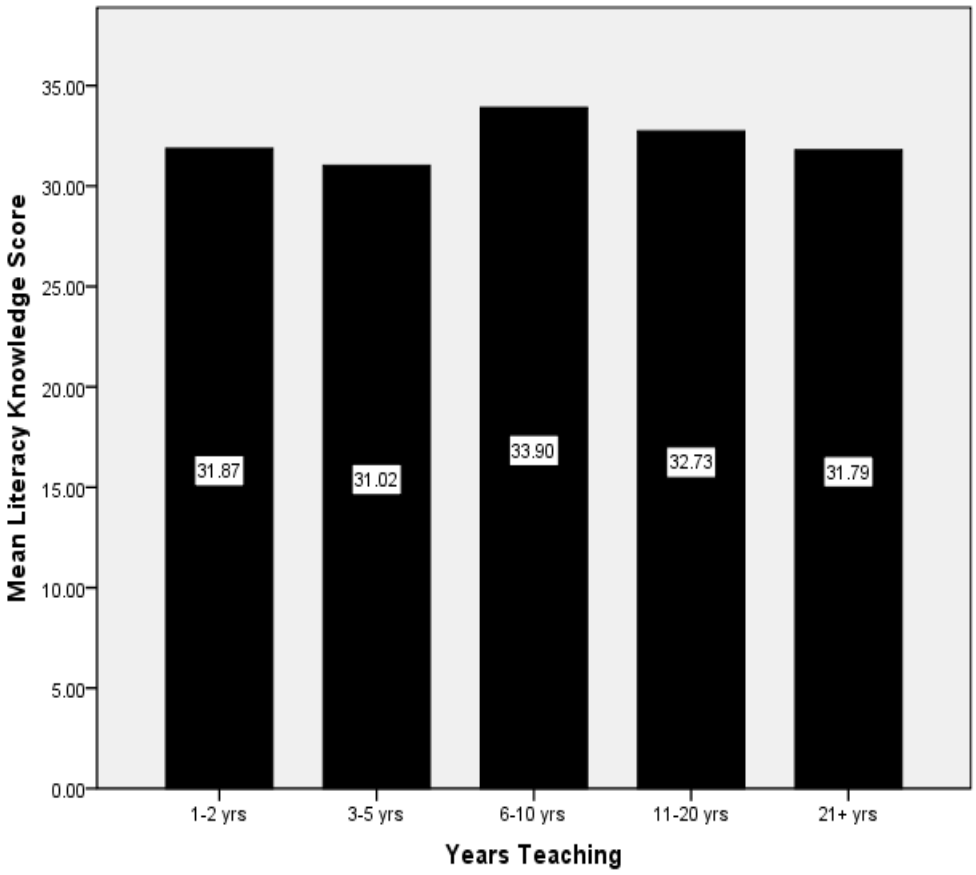

Figure 2. Mean literacy knowledge score as a function of number of years teaching

CHAPTER 5

DISCUSSION

The purpose of this study was to examine whether teacher expertise as defined by pedagogical content knowledge and content knowledge varies with teaching experience. This examination was done using developmental models proposed by Shulman (1986a, 1986b, 1987), who introduced the concepts of pedagogical content knowledge and content knowledge, and Snow et al. (2005). These models have been shown to be based on some of the same theoretical assumptions that are found in the general expertise research (Chi, 2007; Ericsson, 2004, 2007). In fact, the Snow et al. model, which is based on an expertise framework, suggests a trajectory of teacher knowledge development that includes "five levels of differentiated and increasingly sophisticated knowledge that layer upon one another like the layers of an archeological dig" (Callahan, Griffo, & Pearson, 2009, p. 44). To gain more insight into this issue, this study addressed the following two questions regarding 1st - 3rd grade teachers: (a) How does content knowledge and pedagogical content knowledge about reading and reading instruction compare across preservice teachers to advanced experienced teachers?, and (b) What combination of demographic

variables, context variables, and educational background variables are the best predictors of literacy knowledge about reading and reading instruction?

There are three noteworthy findings from this study: (1) the validity of the pedagogical content knowledge and content knowledge constructs warrant further examination, (2) literacy knowledge increases between preservice teachers and inservice teachers who have 1 to 21+ years of experience, but literacy knowledge remains stable across all these years, and (3) that of all the educational background, context, and demographic variables measured by the LIKS-WS, only grade taught, number of graduate courses, and years of experience significantly contributed to the prediction of literacy knowledge, with grade taught being the single most important of the three. Each of these three findings will be discussed in detail.

Construct Validity of PCK and CK

The confirmatory factor analysis showed that items constructed for the LIKS-WS to measure pedagogical content knowledge and content knowledge did not support the two constructs. With a great deal of modification, which resulted from eliminating many of the items, a possible model fit was obtained. To test this modified model, another sample of participants will need to respond to the new LIKS-WS. In addition, a survey only has "construct validity if its relationship to other information corresponds well to some theory" (Kubiszyn & Borich, 1987, p. 280). For example, "if it is supposed to be a test of arithmetic computation skills, you would expect scores on it to improve after intensive coaching in

arithmetic" (Kubiszyn & Borich, 1987, p. 281). However, scores on the LIKS-WS did not improve with increased levels of inservice teaching experience.

There are at least three possibilities for the apparent lack of construct validity to be considered. First, although eight literacy experts identified each of the 78 survey items as PCK or CK, the items were originally constructed to measure knowledge of decoding and comprehension. The items were not expressly designed to measure PCK or CK. Therefore, the items may not do a good job at differentiating between the two constructs.

Second, the coding of the items as PCK or CK may have been done accurately according to the theoretical and operational definitions of the two constructs; however, the two constructs may not do well at measuring the kinds of knowledge that teachers gain with experience teaching literacy. There is a lack of consensus regarding what type of knowledge teachers require to teach literacy (Phelps & Schelling, 2004; Shulman, 1986a, 1986b, 1987; Snow et al., 2005) and how best to assess that knowledge (Pearson, 2007; Rowan et al., 2001). Additionally, it should be noted, that the general expertise research indicates increased knowledge by the individual is not the sole determinant of expertise. Both knowledge and experience must be tempered with deliberate practice with feedback for individuals to achieve expert performances. The issue of whether or not teachers have an opportunity for deliberate practice with feedback was not explored in this study and could potentially be another explanation for the findings. Direct measures of teachers in the classroom teaching literacy may provide more valid measures of literacy expertise.

Third, perhaps the theoretical constructs of PCK and CK are flawed. Although there is strong theoretical support provided for the two constructs (e.g., Shulman, 1986a, 1986b, 1987), the possibility exists that whatever is being measured is simply a unitary construct of teachers' knowledge of literacy instruction. Similar findings regarding teacher knowledge were reported by Reutzel (D. R. Reutzel, personal communication, December 16, 2011) and Carlisle and Phelps (2009). Separating the practice of teaching literacy from the content of literacy may be an impossible task. The same may be true for any domain. Content may dictate teaching practices, and teaching practices may be constrained by content.

The Relationship Between Knowledge and Experience

Based on the assumptions of developmental models (Shulman, 1986a, 1986b, 1987; Snow et al., 2005), it was predicted that teachers' progress through a continuum of knowledge development based on their experience in the profession. To gain more insight into this issue, this study initially attempted to examine how CK and PCK about reading and reading instruction compared across preservice teachers to advanced experienced teachers. However, as discussed previously, the LIKS-WS did not do well at measuring these two constructs. Therefore, a composite measure of the two was calculated and used, so that the first research question was how teacher knowledge of reading and reading instruction compared across preservice teachers to advanced experienced teachers. The results of the data analysis did not support the

prediction based on the developmental models (Shulman, 1986a, 1986b, 1987; Snow et al., 2005) that teacher knowledge as measured by LIKS-WS scores would increase with each level of teaching experience. Instead, the only significant difference was between preservice teachers and inservice teachers with any level of teaching experience (i.e., newly inducted, early experienced, experienced, and advanced experienced). Therefore, all five groups of inservice teachers had higher scores than preservice teachers, but the difference in scores among the five groups of inservice teachers was not significant. Although this finding appears surprising given the framework provided by the developmental models, studies related to teacher experience have yielded mixed results as to the influence of years of teaching experience. In her review of the research, Rice (2010) indicated that the assumption that more experience is better "requires greater nuance" (p. 1) because research studies indicate that experience effects are complex and depend on a number of factors.

The findings of the current study appear to suggest that experience by itself may not be a contributory factor to the development of knowledge of reading and reading instruction past the first 1-2 years of teaching experience. However, caution must be made in the interpretation of these results. As Herman (2010) and Reutzel (2010) note, the LIKS-WS, the survey used in this study, is only a measure of inert knowledge ["talk the talk" (Reutzel, 2010)] and not enacted knowledge ["walk the walk" (Reutzel, 2010)]. So, it is conceivable that experience contributes to development of teacher knowledge but that that type of knowledge was not measured by the LIKS-WS. For example, a

teacher's skill in appropriately pacing instruction for a large group of students with a variety of skill levels is a skill that develops over time. If this indeed is the case, then the classroom instruction of two teachers with different levels of experience, but equal levels of knowledge as measured by the LIKS-WS, may appear very different. One teacher may be able to vary her instruction so that it is appropriate and conducive to her students' learning, while another teacher may not be able to appropriately pace her instruction leading to teaching that is either too fast or too slow for optimal student learning. In other words, the results regarding experience and teachers' LIKS-WS scores might be interpreted as the LIKS-WS does not measure the type of knowledge that teachers gain with experience.

The Prediction of Teachers' Literacy Knowledge

The research base regarding variables that are significantly associated with teachers' knowledge of reading and reading instruction is quite thin (Herman, 2010). The second research question that guided the current study is unique in its attempt to identify the demographic, context, and educational background variables that are the best predictors of 1st-3rd grade teachers' literacy knowledge. This question was exploratory in nature, and because there were no clear arguments about which of the variables may have greater influence on literacy knowledge, a backwards deletion statistical regression was conducted. This analysis removed variables that were not significant and identified only the variables that were the best predictors of literacy knowledge.

In a backwards deletion regression, the model (equation) begins with all of the independent variables (IV) entered. Then, IVs are deleted one at a time if they do not contribute significantly to the regression model. In other words, in backwards deletion, the independent variables whose elimination would produce the smallest reduction in R^2 and which were statistically nonsignificant were systematically removed. In this case, the variables, Reading First School, Level 1 endorsement, yrseffectcode2, gradcousevec2, gradcoursevec3, and Title 1 School were removed. What remained at the completion of this backwards deletion regression were gradcoursevec1 (number of graduate courses), gradevec1 and gradevec2 (grade taught) and yrseffectcode1 (linear relation with years of experience). In the final regression model, these variables accounted for 68.1% of the variability.

In terms of educational background variables, number of graduate courses was found to be significant but only for participants who took 10+ graduate reading courses. Although there was a misprint on the item related to this variable on the copy of the TDIS that was given to inservice teachers (i.e., the multiple-choice item corresponding with the number of graduate reading courses had all possible response options, however, the options were listed as B - E rather than A - D and may have confused some teachers), there is no reason to believe that teachers responded incorrectly. Teachers who took 10+ graduate reading courses scored higher than those who had a Level 1 reading endorsement.

Having more graduate training in literacy certainly should contribute to teacher knowledge of literacy. Although the contribution was quite small (i.e., the variable accounted for only 1% of the variability), it still was a significant contributor. The reason why this variable contributed and a Level 1 Endorsement did not may be straightforward. In the state where this study was conducted, reading endorsements are offered by the state to qualified applicants. The requirement for a Level 1 endorsement, according to the State Office of Education, is the completion of 21 graduate credits, or seven courses in reading. Therefore, teachers with a Level 1 endorsement have three or more fewer graduate reading courses than the level of graduate reading courses that was significant in the model. Those 3+ graduate reading courses may have been the cause for the significant contribution to teachers' knowledge of reading and reading instruction as measured by the LIKS-WS.

Regarding the significant demographic variable, years of teaching experience showed a linear relation that added only slightly to the overall regression model (i.e., only 1%). Therefore, with more teaching experience there was a slight increase in literacy knowledge. When the literacy knowledge of the various groups of preservice and inservice was examined in an ANOVA, the only significant differences that were found were between preservice teachers and each of the inservice teacher groups, with no significant differences among the inservice teachers. These results seem somewhat contradictory; however, the regression analysis was conducted with only the inservice teachers and excluded preservice teachers, who were included in the ANOVA. Moreover, in the

regression analysis, each independent variable is examined in combination with the other independent variables, whereas in the ANOVA, teaching experience was examined independently of other variables. Therefore, the differences in statistical analyses and the samples being examined may have been the cause of these seeming differences. The results of the ANOVA do echo the results of Rice's (2010) most recent analysis of the existing research on teacher knowledge and experience, which states that research studies indicate that experience effects are complex and depend on a number of factors. Because of the complexity of the findings regarding teacher knowledge and experience coupled with the fact that the assumption that more experience is better is being challenged by Rice as requiring "greater nuance" (p. 1), additional longitudinal studies on teacher knowledge and experience are warranted to further our understanding of this complex issue.

Finally, regarding context variables, findings suggest that grade currently teaching was significant but Reading First School and Title 1 School were not significant. In fact, grade taught was by far the largest contributor to literacy knowledge, accounting for 66% of the total 68% of the variability. Following the multiple regression, an ANOVA was conducted to take a closer examination of the grade level variable. The results of the ANOVA indicating that second grade teachers scored higher on the LIKS-WS than first grade teachers and third grade teaches scored higher than second grade teachers. In other words, teachers' scores increased with each grade level. Although there are many studies that have explored the relationship between teachers mathematical knowledge

according to teacher test scores and grade level taught (Goe, 2007; Goe & Stickler, 2008), there are few studies that have examined teachers' test scores in literacy according to their grade level. One such study, indicated that first grade teachers score higher on tests of literacy knowledge than their second and third grade counterparts (Carlisle, Correnti, Phelps, & Zeng, 2009), a finding that is counter to the findings of this study.

What could possibly explain why teachers' scores increase with grade level? One possible explanation is the *No Child Left Behind Act* of 2001, which authorized funding for a federal initiative called *Reading First*. Due to pressure from the federal level, schools both with and without Reading First programs focused more professional development on literacy, with an emphasis on educating students to be able to read on grade level by the third grade. Some studies have found that professional development has a positive impact on teachers' knowledge of reading and reading instruction (Brady et al., 2009; McCutchen & Berninger, 1999; McCutchen et al., 2002, McCutchen et al., 2009). In other words, regardless of the amount of knowledge a teacher has about literacy, this knowledge can still grow and develop with professional development. Therefore, teachers may have knowledge about learners at a given level of literacy development, but when they participate in professional development, the teachers develop a richer more complex understanding of literacy development, which encompasses more levels of student learning over time. This concerted effort to provide teachers with additional literacy professional development that focused on having all students reading on grade

level may have caused a unique knowledge development effect in teachers whose classrooms contain the most diverse range of literacy learners.

What type of unique knowledge development effect may have been caused by this increased focus on having all students reading on grade level by third grade? In essence, this push to have students read on grade level by third grade may have produced a type of "Matthew hypothesis" (Walberg & Tsai, 1983) or "Matthew effect" (Stanovich, 1986) with regards to teachers knowledge of literacy. The Matthew effect (a phrase often associated with the explanation of how the gap between good readers and poor readers is perpetuated despite continued education) is relevant to the discussion on how teacher knowledge varies according to grade level. The Matthew effect is relevant in that it can be operationally defined as "you know best what you use the most".

Hypothetically, all teachers start out with a basic amount of knowledge about reading and reading instruction that pertains to the grade level they teach. However, this basic knowledge may not be enough in classrooms which have a multiplicity of reading levels. For example, this basic knowledge might best fit a first grade classroom which has students with the smallest range of literacy achievement and might be found to be most lacking in a third grade classroom which contains a more diverse range of student achievement in reading. What does the Matthew effect have to do with a teachers' basic knowledge of literacy? Teachers who have basic levels of knowledge, who are motivated to address a multiplicity of reading levels in the classroom, and who are given additional professional development in areas may have more knowledge than other

teachers because they are in a position to use this additional knowledge in their classrooms. These findings have significant implications for teachers who change grade levels particularly those who move from classrooms with fewer reading levels to those with a multiplicity of reading levels. Because this study was not designed to explore this idea, future research will be needed to validate this hypothesis.

Limitations

There are several limitations of this study. First, the population was predominantly White females, which although representative of the current population of elementary teachers in Utah, may be slightly dissimilar to the current population of teachers in other areas of the United States.

Another limitation was the fact that the participants in this study were a convenience sample whose results may have been skewed for two reasons. First, the inservice teachers that comprised this convenience sample were paid a stipend for their participation in this study and the preservice teachers were requested to take the survey in their last seminar class. Second, because participation in this study was voluntary, consideration must be given to the possibility that both groups, the inservice and preservice teachers, consisted of teachers with high levels of interest in reading and reading instruction as well as a high level of confidence in their knowledge of literacy. Teachers with lower levels of knowledge and confidence in their ability may have chosen not participate in the study.

The next limitation of this study concerns *The Literacy Knowledge Instruction Scales-Written Survey* (LIKS-WS) and the type of knowledge that was measured by this instrument. The LIKS-WS was created and designed to measure inert, or "talk the talk" (Reutzel, 2010) knowledge of literacy. It should be noted that this inert knowledge is of general literacy, not content knowledge and pedagogical content knowledge of literacy. Also, it was not the intention of the LIKS-WS to measure enacted knowledge, that is, the ability to transfer inert knowledge of reading and reading instruction into the actual act of teaching (e.g., "walk the walk"). For the purpose of analyzing and interpreting the results of this study, it is important to understand that the current study is restricted to teachers' inert general knowledge of reading and reading instruction.

Another limitation of the LIKS-WS was that there were many items that were not performing well according to the CFA and SEM, therefore items on the LIKS-WS may need to be modified or eliminated for the instrument to more effectively measure literacy knowledge. A more parsimonious version of the LIKS-WS may prove to be beneficial for both researchers and participants.

Another limitation involves the second survey instrument, the *Teacher Demographic Information Survey* (TDIS) that was used to collect data on participants' backgrounds. The reliability of both versions of this instrument was not taken into consideration, thus it must be noted as a potential limitation. Items could also be examined, extraneous items could be culled, and remaining items could be placed into more meaningful categories.

Also, with regards to the TDIS, some variables would be better measured as continuous variables instead of categorical variables. For example, on a revised version of the TDIS a blank could be left on the response sheet for number of graduate reading courses taken so that participants could indicate the actual number of courses they had completed instead of a range of courses they had taken (i.e., 0 - 2, 3 - 5, 6 - 10, 10+). In this way, future researchers would not be sacrificing accuracy for convince of scoring the survey instrument.

Implications of the Study and Future Directions of the Study

Given this study's attempt to substantiate a developmental model of teacher knowledge of literacy based on the LIKS-WS assessment of content knowledge (CK) and pedagogical content knowledge (PCK), further studies of content and pedagogical content knowledge must take into account several issues. With regard to teacher CK and PCK, teacher educators and researchers need to get better at measuring teacher knowledge. In order to get better at measuring teacher knowledge, the field needs to clearly define what it is we mean by teacher knowledge and there should be a consensus with the use those definitions in their research. Alexander (1992b) has highlighted the importance of domain knowledge for some time. Teacher researchers and educators need to embrace this idea. Having a set of knowledge for the domain of reading and reading instruction will facilitate the field's ability to assess content validity of assessment tools by examining whether experts have this knowledge but novices do not (Pearson, 2007). An additional benefit of well-defined domain knowledge

is that researchers will be in a better position to look further at the effect of grade level contributions to teachers' overall knowledge of reading and reading instruction. A future study exploring the contributions of grade level knowledge to teachers' overall literacy knowledge might prove to be enlightening.

The finding that inservice teachers, even those with only 1 to 2 years of teaching experience, have more knowledge than preservice teachers has implications for teacher education. It is possible that more current scientifically based reading research needs to be integrated as part of the curriculum in teacher education programs. It is also a distinct possibility that teacher educators and colleges of education need to analyze the best practices in delivering this scientifically based reading research to preservice teachers. Perhaps providing preservice teachers with more in class practice of teaching would make them more like even the slightly more experienced teacher. Future research should focus on these issues regarding preservice teacher knowledge.

However, with regards to inservice teachers, one might anticipate a larger difference in teachers' knowledge as they gain more experience. Clearly more needs to be done in the area of professional development if we wish to have experienced teachers with an increased knowledge of literacy. In order to address these professional development issues, we need longitudinal studies of teacher learning and knowledge development that are theoretically based, empirically driven, and not just a compilation of opinions regarding how teacher knowledge develops.

This study also indicates that additional education, both in the form of graduate reading courses (10+) increases teachers' knowledge of reading and reading instruction. In terms of teachers increasing their knowledge of reading and reading instruction throughout their careers, this is significant. In fact, given the encouraging findings regarding graduate reading courses and the lackluster findings regarding Reading First and Title 1, researchers may want to explore initiatives that can more effectively educate these teachers, possibly through participation in graduate course work in literacy, for the benefit of the students who participate in these federally funded programs. It should be noted that this study did not examine the types of professional development that were implemented as part of Reading First or Title 1 initiatives.

Due to the relatively young field of educational testing and measurement and the relatively new use of fine-grained assessments such as the LIKS-WS to assess teacher knowledge, it is not surprising that despite the efforts of the LIKS-WS research team, the instrument may need additional revisions if it is to be used to measure content knowledge and pedagogical content knowledge of literacy. However, since at this time our understanding of content knowledge and pedagogical content knowledge is more theoretical than research based, it is possible that educational researchers will need to explore which assessments do a better job of assessing the different types of knowledge teachers need in their profession. In essence, researchers need to continue to develop better tools to measure teacher knowledge.

APPENDIX

TEACHER DEMOGRAPHIC INFORMATION SURVEY (TDIS)

104. Which university or college do you attend?

A. University of Utah
B. Utah State University
C. Weber State University
D. Brigham Young University
E. Utah Valley University
F. Westminster College
G. Southern Utah University
H. Dixie State University
I. Other

105. How many **undergraduate** courses have your completed in reading?

A. 1 - 2
B. 3 - 4
C. 5 - 6
D. 6+

106. How many **graduate** courses have you completed in reading?

A. 0 - 2
B. 3 - 6
C. 6 - 9
D. 10+

107. Have you completed or will you complete your student teaching this semester?
A. Yes
B. No

108. When did you receive your last college degree?

A. Before 1970
B. 1970 - 1979
C. 1980 - 1989
D. 1990 - 1999
E. 2000 - present

109. What is your highest level of degree?

A. Bachelors
B. Masters
C. PhD.

110. What is your gender?

A. Female
B. Male

111. What is your age?

A. 20 - 29
B. 30 - 39
C. 40 - 49
D. 50 - 59
E. 60+

112. Please indicate your ethnicity.

A. African American
B. American Indian
C. Asian
D. Caucasian/White
E. Hispanic Latino
F. Native Hawaiian/Other Pacific Islander
G. Other

113. On a scale of 1 - 5, with 5 being the highest, how would you rate your knowledge of vocabulary and vocabulary instruction?

A. 1
B. 2
C. 3
D. 4
E. 5

114. To what extent do you believe that you are adequately prepared to address the needs of struggling readers?

A. Extremely well prepared
B. Quite well prepared
C. Moderately prepared
D. Not very well prepared
E. Not at all prepared

115. On a scale of 1 - 5, with 5 being the highest, how would you rate your knowledge of decoding/phonics and phonics instruction?

A. 1
B. 2
C. 3
D. 4
E. 5

116. On a scale of 1 - 5, with 5 being the highest, how would you rate your knowledge of comprehension and comprehension instruction?

A. 1
B. 2
C. 3
D. 4

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